July/August 1995 $2.00

MONTANA OUTDOORS

Our Point of View

DAVE BOOKS

Twenty years ago the Madison River was the heart of controversy. A practice dating back nearly a century was being challenged. Should we continue to stock hatchery trout or would wild fish be able to make it on their own?

Failure would be a major setback to wild trout management and to Fish, Wildlife & Parks' credibility. But it did not fail. In fact, the wild trout fishery succeeded well beyond expectations.

The Madison River fishery has achieved icon status among trout anglers worldwide. They spend over $16 million per year, making the total use value of the river nearly $48 million. Twenty years ago a traveler was hard pressed to find a gas station open after 10 p.m. in Ennis. Not today.

Then it happened. The unthinkable. A microscopic organism that requires tiny tubificid worms to complete its life cycle was discovered in December of 1994 in the Madison River. It has infected the rainbow and brown trout. A 90% decline in rainbow numbers is thought to be related to this whirling disease.

There are many more questions at this point than answers. Some states have stood firm that whirling disease is no big deal. After all, the federal government downlisted the disease in 1988. Other states believe it to be a problem. Some cannot decide.

Despite the controversy, Montanans and our friends who come here to fish have remained remarkably focused. There has been no blaming. There has been no overreaction, although the issue has remained highly visible. Instead, people have banded together to try to understand whirling disease, to contain its spread, and to seek answers that will guide us in the future.

A private foundation has been formed to raise money to help fund needed research. A conference has been held to network scientific expertise from across the continent. The legislature passed bills that make it illegal to transport fish live and that strengthen inspections of private fish ponds. The governor created a task force to stimulate a collaborative private/public partnership to address scientific, educational, and financial concerns. All this occurred within five months of the discovery of whirling disease.

The Madison River is used to being at the heart of controversy. Now we can hope. Hope that the Madison River will become home to wild trout that evolve to resist and flourish in the wake of whirling disease.

Patrick J. Graham, Director
Montana Fish, Wildlife & Parks

AL DEMANGELAERE

The monarch—one of Montana's 186 butterfly species—flies thousands of miles in fall to winter in Mexico or California (page 7).

State of Montana
Marc Racicot/Governor

Montana Fish, Wildlife & Parks Commission
Stan Meyer/Chairman
Dave Simpson/Vice Chairman
Darlyne Dascher
Charles Decker
Dale Tash

Montana Fish, Wildlife & Parks
Patrick Graham/Director
Bob Martinka/Chief of Staff Operations
Dave Mott/Administration and Finance

Conservation Education Division
Ron Aasheim/Administrator

Montana Outdoors Staff
Dave Books/Editor
Bev Veneziano/Art Director
Debbie Sternberg/Circulation Manager

Montana Outdoors (ISSN 0027-0016), the official publication of Montana Fish, Wildlife & Parks, is published bimonthly (January, March, May, July, September, and November). Contributions (manuscripts or illustrations) are welcome with the understanding that the department or the editor cannot be responsible for loss or damage. All contributions will be published at the discretion of the editor. For subscription information, phone 800/678-6668 (toll-free). Subscription rates are $7 for one year, $12.50 for two years, and $17 for three years. (Please add $3 per year for Canadian subscriptions. All other foreign subscriptions, air mail only, are $22 for one year.) Individual copies and back issues cost $2 each, plus postage and handling. Although ***Montana Outdoors*** is copyrighted, permission to reprint articles is available by writing our office or phoning us at 406/444-2474. All correspondence should be addressed: ***Montana Outdoors***, Montana Fish, Wildlife & Parks, 930 West Custer Ave., P.O. Box 200701; Helena, MT 59620-0701. ©Montana Fish, Wildlife & Parks, 1995. All rights reserved. Indexed by States' Periodical Index, 1660 Smithville Road; Havre, MT 59501.

Postmaster: Send address changes to ***Montana Outdoors***, Montana Fish, Wildlife & Parks, 930 West Custer Ave., P.O. Box 200701; Helena, MT 59620-0701. Second-class postage paid at Helena, MT 59620, and additional mailing offices.

MONTANA OUTDOORS

July/August 1995
Volume 26, Number 4

Features

2 NATURE'S TIME CAPSULE
by Bonnie Heidel
Special wetlands called "peatlands" have chronicled Montana's landscape changes since the age of the last glaciers.

7 WATCHABLE WILDLIFE—RAINBOWS ON THE WING
by Deborah Richie
With their bright colors and glinting flight, butterflies can become our guides to the insect world.

13 THE FORGOTTEN STREAMS
by John Barsness
Their names may not be well known in angling lore, but their trout are unforgettable.

17 LANDS LEGACY—SPIRIT OF THE FRONT
by Bruce Auchly and Quentin Kujala
The wonders and worries of the Rocky Mountain Front are all present at Ear Mountain Wildlife Management Area.

21 TROUBLE IN TROUT PARADISE
by Tom Palmer
Whirling disease—a baffling ailment caused by a tiny parasite—is threatening the Madison River's wild rainbow trout.

25 A NEW PLAN FOR MONTANA'S TRAILS
by Jeff Erickson
A comprehensive look at the state's trail system will help identify needs and balance the interests of all users.

28 PERSPECTIVES—STATE PARKS MAKE MEMORIES
by Debbie Cheek
This year's State Parks Poster Contest for fifth grade students generated a record number of entries.

Departments

30 CATCHALL—FWP's "Mr. Wildlife" Retires
32 FROM THE FIELD—Seeking Peace on Montana's Rivers
35 BOOKSHELF
36 READERS RESPOND
37 CONTRIBUTORS

COVERS—Angler releasing brown trout by Dusan Smetana
Newly emerged mourning cloak butterfly by Kristi DuBois

MARIA MANTAS

Round-leaved orchis, one of several rare orchids that grow at the margins of Montana's peatlands.

NATURE'S TIME CAPSULE

by BONNIE HEIDEL

THE CIPHERS OF TIME are written mainly in water and stone, fragmentary and obscure beneath the big skies of Montana. But another record of ancient times lies buried in special wetlands across the state. Called "peatlands," they are, in a sense, nature's time capsule—a meticulous chronicle of landscape change since the age of the last glaciers.

Peatlands formed when spongy, dead plant matter accumulated under conditions that limited microbial decay, faithfully preserving all that landed on their surface...or had the misfortune to fall through. In European peatlands, the remains of ancient humans and woolly mammoths have been discovered virtually intact.

Modern-day inhabitants of Montana's peatlands are animals and plants that thrive in the presence of low temperatures and a stable supply of cold groundwater. Many are species more commonly found farther north, but whose ranges extend southward along the Rocky Mountains. Some of Montana's most puzzling and beautiful animals and plants live in peatlands, including carnivorous plants, showy orchids, and the elusive bog lemming.

Strangely enough, the refrigerator-like conditions maintained by constant groundwater flow are milder than the "deep-freeze" of typical Montana winters. As a result, Montana's peatlands also host uncommon plants and animals that are otherwise restricted to hot springs. Fireflies, for example, light the evening sky at Pine Butte Swamp, a premier peatland northwest of Choteau, and giant helleborine—a large, lovely orchid—reaches the northern limits of its range in peatlands here.

Although peatlands are mere flecks on Montana's landscape in terms of overall area, they are more than odd curios. They serve as diverse aquatic systems whose health often mirrors that of the local landscape. Many of their inhabitants are biological heirlooms—species whose fate depends upon the stable habitats that peatlands provide. On a worldwide basis, peatlands are believed to store significant carbon reserves, perhaps rivaling tropical forests in stabilizing the global climate.

STEVE CHADDE

Peatlands are scattered across the glaciated portions of Montana, but they are most common in the northwestern part of the state. They form in active seepage areas associated with glacial moraines and glaciated valleys. Although little is known about their age and growth rate here, "fast-growing" peatlands build at a rate of only about four inches per century.

Although sometimes referred to as "bogs," Montana's peatlands are correctly termed *fens*. Technically, bogs are acidic, nutrient-poor peatlands that receive water solely from precipitation; fens, on the other hand, are mildly acidic or alkaline peatlands that have a constant source of groundwater. In Montana, fen vegetation can include carpets of sphagnum mosses that literally float on water, spongy-mat coverings of sedges and other grasslike plants that resemble a meadow, and special shrubs. Some of the most peculiar fens have intricate patterns of linear mounds and pools.

ILLUSTRATION BY MITCHELL PAULSON

Pollen deposited in peatlands reflects the vegetative composition of the surrounding landscape.

Just as peatlands are chronicles of landscape change, pollen is time's primary scribe. Produced in abundance and deposited in a well-mixed "rain," pollen reflects the vegetative composition of the surrounding landscape. Perfectly preserved in the oxygen-free environment of a peatland or lake bottom, the pollen record enables scientists to reconstruct the landscape and climatic conditions that existed thousands of years ago. For example, pollen grains from core samples taken in northwestern Montana peatlands document the arrival of western hemlock in the area some 2,770 years ago. This time period marked the emergence of local plant and animal communities much as we know them today.

Local fire history, too, is written in the peatland chronicles in the form of charcoal fragments deposited by wind or water erosion from surrounding terrain. Scientists are currently researching the history of fires ignited by lightning or Native Americans in northwestern Montana by carbon-dating the ash contained in peatland core samples.

As we search for land management "crystal balls" to guide us in the future, we dare not ignore the rear-view mirrors. Montana's peatlands are precious natural laboratories that provide us with a unique way of comparing the present with the past. ■

FLESH-EATERS OF THE PLANT KINGDOM

Flesh-eating plants stir the imagination, as witnessed by their popularity in the nursery trade and the horror movie industry. They have a special affinity for peatlands and other relatively sterile settings around the world.

Charles Darwin, nineteenth-century evolutionary theorist and author of *Insectivorous Plants*, was one of the first naturalists to study the bizarre adaptations of carnivorous plants. As he noted, these plants compensate for the nitrogen-poor environments in which they live by "eating" small invertebrates, especially insects and tiny aquatic crustaceans.

Of some 550 plant species that supplement their diet of water, soil nutrients, and energy from the sun with animal matter, perhaps the best known is the Venus fly trap (*Dionaea muscipula*). This popular houseplant—whose sticky leaves can fold in half to engulf a hapless insect—grows wild only in the Carolinas, but is widely propagated from seed by commercial growers.

Despite the fly trap's lack of nerve cells, action potentials travel as a wave of charged ions from sensory hairs, which detect an insect's arrival, to the outer surfaces of the hinged "mouth." This electrical flux causes some of the plant cells to expand rapidly, squeezing the trap shut. The reaction time is several seconds, compared with thousandths of a second for most animals, but the capability is amazing nonetheless.

Montana is home to seven flesh-eating wild plant species, most of them restricted to peatlands. They employ one of two strategies in capturing their prey: "passive capture" (used by butterwort and sundews) or "active capture" (used by bladderworts).

Butterwort (*Pinguicula*), which grows in northern lati-

MARIA MANTAS

STEVE WIRT

DEE STRICKLER

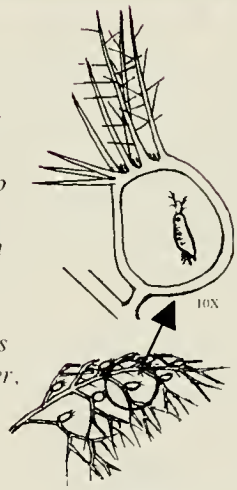


ILLUSTRATION BY BONNIE HEIDEL

Montana's seven species of carnivorous plants include linear-leaved sundew (top left), butterwort (left), and common bladderwort (above). Bladderwort grows submerged in water, sending only flowers above the surface for pollination. Thread-like leaves below the surface support tiny bladders (see illustration) that inflate to capture unsuspecting invertebrates.

tudes, displays the simplest technique—the upper surfaces of its thick leaves are covered by glands that emit a sticky ooze. The outermost edges of its leaves can roll inward slightly, but do not surround prey as do those of the Venus fly trap. In Montana, butterwort is restricted to the northernmost portions of the Rocky Mountains, where it grows in wet alpine meadows (though in much of its range it occupies peatlands, such as the "blanket bogs" of the British Isles).

Sundews (*Drosera*) also have sticky leaves with glandular hairs that respond to touch and to nitrogen-rich solutions such as insect proteins by s-l-o-w-l-y flexing inward. The raised glands of sundews release large, sticky drops that literally glitter in the sun like dew. The three sundews found in Montana are English sundew (*Drosera anglica*), linear-leaved sundew (*Drosera linearis*), and round-leaved sundew (*Drosera rotundifolia*). Of these, the first two live only in peatlands.

Both butterwort and sundews release acids and digestive enzymes when they are in contact with prey. These protein-digesting enzymes are very similar to those found in the digestive tracts of vertebrates. For this reason, butterwort leaves have been used in northern Europe to heal festering sores on animals and to curdle milk in the production of a special cheese. All enzyme activity takes place outside the plant, and the end-products are absorbed back through the cell walls.

Active carnivores like bladderworts (*Utricularia*) have the benefit of a cage with a trap door for capturing prey. The underwater "bladders," which resemble tiny plastic bags about an eighth-inch in length, are scattered among thread-like leaves. When unsuspecting invertebrates brush against the hairs along the bladder opening, the bladder rapidly inflates, a rush of water sweeps the captive inside, and a valvate door shuts. Flat-leaved bladderwort (*Utricularia intermedia*), lesser bladderwort (*Utricularia minor*), and common bladderwort (*Utricularia vulgaris*) grow submerged in water, sending only flowers above the surface for pollination. The first two of these are found only in peatlands.

Of Montana's seven carnivorous plant species, three are recognized as "species of special concern" (English sundew, linear-leaved sundew, and flat-leaved bladderwort). The peatlands in which these flesh-eaters of the plant kingdom dwell are difficult places in which to make a living...but carnivorous plants wouldn't have it any other way!

Note: If you are considering growing carnivorous plants, please do not collect them from the wild. Obtain them from a retailer, but only after ascertaining that they have been propagated, not collected.

A SPECIAL TASTE IN REAL ESTATE

Montana's lemmings may not jump from cliffs into the sea like their Norwegian brethren, but their existence could be just as precarious. One of Montana's most secretive mammals, the northern bog lemming (*Synaptomys borealis*) inhabits only a few peatlands in Montana. In fact, prior to 1992, it had been recorded only five times in the state, and one of these "sightings" consisted of a skull found in an owl pellet! Recent surveys, however, have led to discovery of 12 additional peatlands inhabited by bog lemmings in western Montana, on public lands both east and west of the Continental Divide.

Each of these peatland settings contains a thick mantle of mosses, mainly sphagnum. Bog lemmings have long been known to burrow into hummocky moss mounds, but recent examination of bog lemming stomachs has revealed moss to be a major item in their diet—nature's nutritional equivalent to eating styrofoam!

Similar in appearance to mice or voles, bog lemmings have an extremely short tail (usually less than an inch) and unique teeth characteristics, as well as special habitat requirements. In the lower 48 states, they are restricted to peatlands in Montana, Idaho, Washington, Minnesota, and New England.

JIM REICHEL

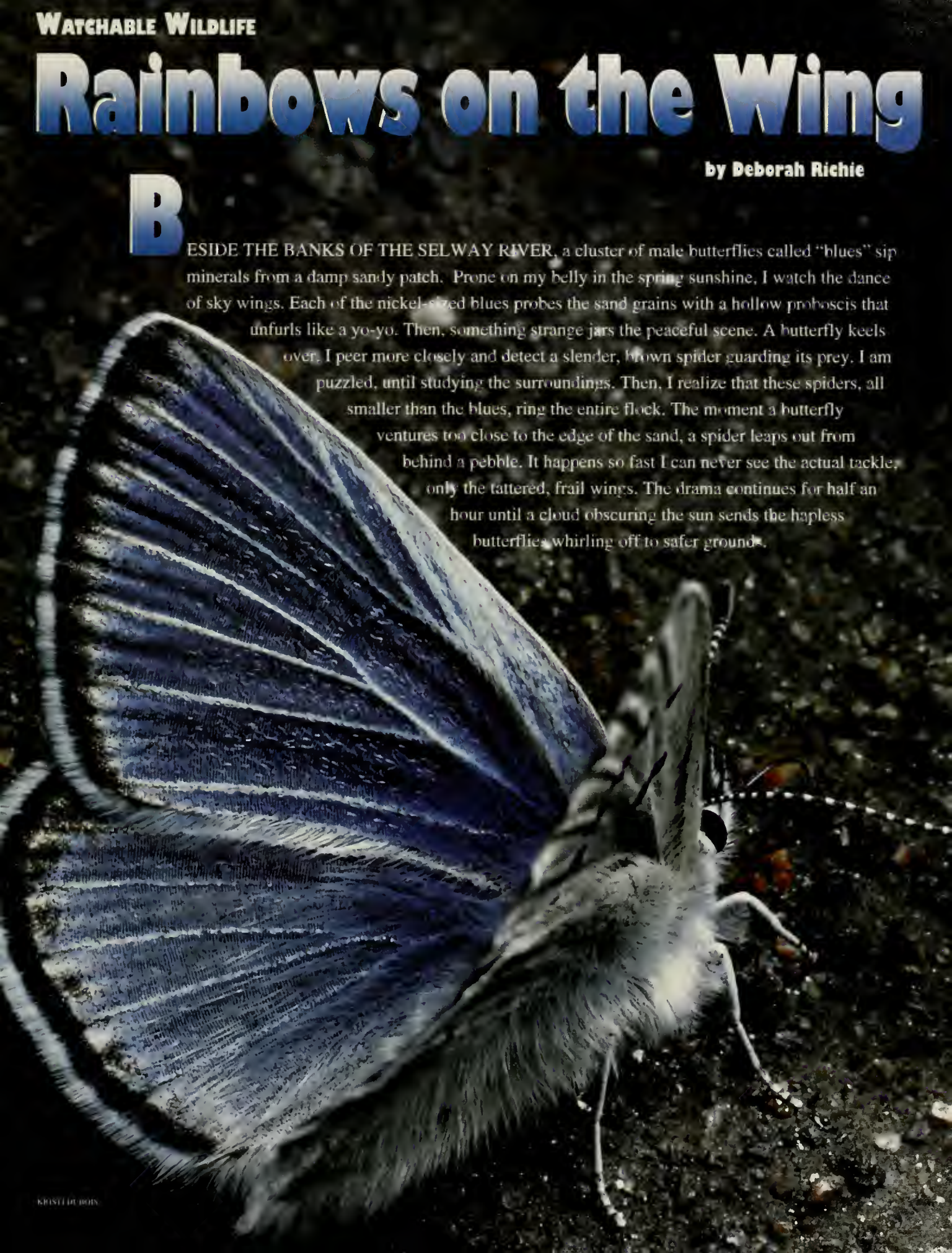
The northern bog lemming's diet includes an array of peatland mosses. These secretive mammals show no signs of eating themselves out of house and home.

Bog lemming studies are still in their early phases, so far producing far more questions than answers. Little is known about their reproduction, population numbers, life history, or home range. We do know they don't migrate en masse like Norwegian lemmings to search out new habitats when over-crowding occurs. For Montana's bog lemmings, there just isn't any other place like home.

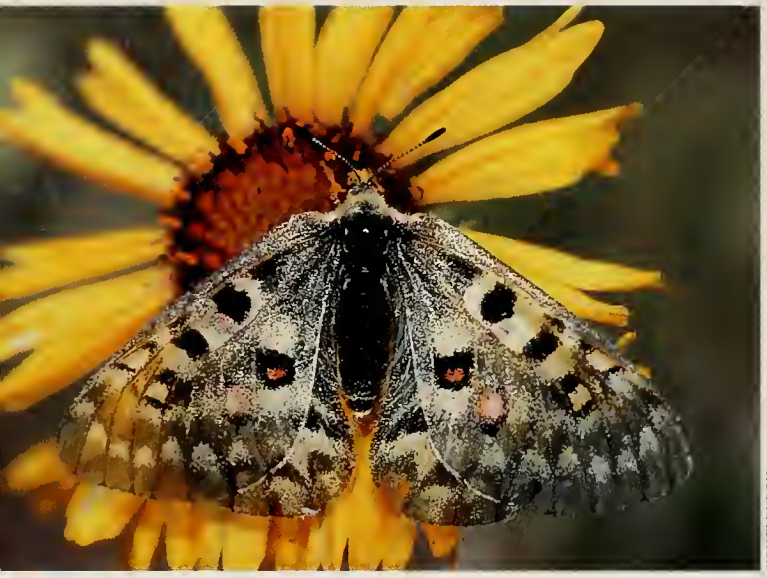
Rainbows on the Wing

by Deborah Richie

BESIDE THE BANKS OF THE SELWAY RIVER, a cluster of male butterflies called "blues" sip minerals from a damp sandy patch. Prone on my belly in the spring sunshine, I watch the dance of sky wings. Each of the nickel-sized blues probes the sand grains with a hollow proboscis that unfurls like a yo-yo. Then, something strange jars the peaceful scene. A butterfly keels over. I peer more closely and detect a slender, brown spider guarding its prey. I am puzzled, until studying the surroundings. Then, I realize that these spiders, all smaller than the blues, ring the entire flock. The moment a butterfly ventures too close to the edge of the sand, a spider leaps out from behind a pebble. It happens so fast I can never see the actual tackle, only the tattered, frail wings. The drama continues for half an hour until a cloud obscuring the sun sends the hapless butterflies whirling off to safer ground.



KRISTI DUBOIS



KRISTI DUBOIS

Adult butterflies, like this female phoebus parnassian, seek nectar from a variety of flowers.

Enticed by the shimmering of the blues, I discovered a spectacle I would never have witnessed without their bright allure. Butterflies, in all their rainbow colors, glinting flight, and propensity for flowers, can become our guides to the insect world. Some scenes may not be pretty to watch. Yet, the saga of predators stalking prey has led to the evolution of amazing defenses in every stage of a butterfly's life.

To become a butterfly watcher you must seek sunshine, flowers, and relaxation: a fine prescription for the often harried American lifestyle. To take the next step and actually learn names can be intimidating. Like learning a new language, however, you can build your vocabulary gradually.

In Montana, we have 186 recorded species of butterflies, compared with 144 species of breeding land birds. The good news for novices is that butterflies, unlike birds, all fall into a few families: swallowtails, sulphurs and whites, brush-footed butterflies, and gossamer wings. Skippers are another family, separated from true butterflies by their hook-shaped antennae. Of course, there are groups to learn within the families. The brush-foots, for instance, helpfully include groups named for telling characteristics, such as the checkerspots, crescents, and anglewings.

The cold winters here limit the number of butterfly species; there are over 700 in North America and 15,000 to 20,000 species worldwide. We may not have the variety, but some of our residents are as stalwart as our most rugged mountaineers. For example, *ursadentis*, the Beartooth butterfly (a subspecies of bog fritillary that dwells in the Beartooth Mountains), endures relentless storms to live among alpine willows, pollinating wildflowers in the thin, crisp air.

The venerable butterflies possess sensational strategies for survival. Not surprisingly, their 40 million-year-old fossil record matches the onset of flowering plants. Moths, the only other member of the order Lepidoptera (meaning scaly wings), date back an impressive 100 to 140 million years. Of the 170,000 known species of Lepidoptera, 90% are moths.

Butterfly or Moth?

Distinguishing a moth from a butterfly appears easy, until you start listing all the exceptions. The surest difference lies in their antennae. Butterfly antennae are clubbed at the tips. Moth antennae taper to a point and are sometimes feathery, serving as sensory devices for males to catch the whiff of a female on a dark night. As mostly a nocturnal group, moths have no need for the dazzling colors of butterflies to attract one another. Their often earth-tone colors and night-flying habits mean they are ignored, unless labeled a pest or a producer of silk. Very few moths actually fall into that clothes-munching group called millers. Names like polyphemus, pink-spotted hawkmoth, and tiger moth rightly suggest some wonderfully sophisticated insects to get to know someday.

Butterflies admittedly steal the show, even in their naming. Try great spangled fritillary, wood nymph, brown elfin, tiger swallowtail, and phoebus parnassian, all Montana inhabitants. The star-studded cast appears only briefly on stage, some species racing through metamorphosis (egg, caterpillar, pupa, butterfly) in a few weeks. Adults rarely grace the world with winged elegance for more than a week or two.

There are exceptions. On a warm day in winter, you might glimpse chocolate wings rimmed in yellow as a hibernating mourning cloak wakes briefly for a preview of spring. Some caterpillars hibernate too, snuggling under a leafy quilt. The famous monarch butterfly flies undaunted thousands of miles in the fall to winter in Mexico or California in enormous roosts. Their chosen trees palpate with thousands of orange and black wings.

How fast the ugly-duckling caterpillars transform into graceful-swan butterflies hinges on caterpillar diet and climate. Larvae that feast on nutritious flowers and fruits grow much more speedily than those that chew leaves. Mild climates allow for several generations of butterflies. As any gardener can attest, Montana's growing season is brief. In fact, for some of our alpine butterflies, it takes two years for one life cycle to be completed.

The flourish of adult butterflies traces the blooming of wildflowers from early spring through fall. Sulphurs and whites are among the first to test the flowers, along with the western elfin, a small brown butterfly that savors ceanothus blossoms.

Caterpillar Capers

The complete metamorphosis of butterflies features survival adaptations at every stage. At a time preordained by its genes, the caterpillar takes shape inside the egg. Thanks to the care of the female butterfly in choosing the right host plant to lay her egg or eggs upon, the larva can start munching at once, often starting with the eggshell as its first meal. The voracious eater soon outgrows its skin and pauses a bit while new skin and a larger head capsule forms beneath the old skin. Then it pops out of the old skin as if it were casting

DAVE MCGEE

KRISTI DUBOIS

Although most animals change markedly from juvenile to adult, butterflies undergo a profound metamorphosis. The caterpillar stage of the tiger swallowtail (above) bears no resemblance to the elegant adult (top photo).

off soiled clothes and emerges fresh and ready to chew again. Each growth spurt between molts is called an instar. After five instars over a period of three to six weeks, the caterpillar has gained all the energy it needs for the miracle ahead.

If caterpillars could dine on any leaf, flower, or grass, we'd see a sorry bunch of plants everywhere. Some plants, it turns out, fight back. Through the eons, they gradually devised a toxic brew to repel the insects that would devour them. In turn, caterpillars evolved ways to detoxify the poison for certain plant species. That's why larvae tend to be more closely tied to their host plants than nectar-seeking adults. In some cases, caterpillars that eat poisonous plants become noxious themselves to birds and other would-be predators, and pass the same defense to the adult butterfly. For instance, monarch caterpillars thrive on the distasteful milkweed and retain the flavor throughout life. Birds refrain from nabbing either monarchs or the viceroy that mimics the monarch in appearance.

Some caterpillars are able to return a favor to the plants they feast upon. It may sound fantastic, but the chubby creatures can create a complex molecule in their saliva and transfer it to a chewed-on leaf, helping the leaf repair itself and continue to grow.

A juicy caterpillar—unless toxic—becomes a meal for many a songbird, an important role for birds in controlling larvae numbers. To better their chances of escaping predation,

KRISTI DUBOIS

To better their chances of fending off predators, caterpillars may blend perfectly with their host plants' leaves or twigs, don clever disguises, or grow sharp spines, like the mourning cloak caterpillar pictured here.

caterpillars have donned a myriad of disguises, from blending perfectly into a leaf or twig, to growing sharp spines or sporting fake eyes or horns. The slug-like caterpillars of blues rely on ants to defend them. The ants tend the caterpillars for the honeydew they secrete. When a spider approaches the caterpillar, the ants swarm upon the would-be attacker.

The mature caterpillars then turn to the task of finding a sheltered spot to become a pupa, called a chrysalis, from the Greek word for gold. (In some species the pupa bears gold or silver designs.) Once the leaf or stem is chosen, the caterpillar spins a silk harness and may pull a leaf roof over itself with another thread. When its larval skin is shed to reveal the pupa beneath, the next miracle begins. Inside this legless shell the cells that will become an adult start to change. It is these energy-demanding transformations that require the caterpillar to be an eating machine.

Sensational Adults

When the butterfly squeezes through the chrysalis shell, the first task is to unfurl its compressed wings. Pumping fluid into the wings allows them to expand. A few hours later the wing veins harden and the slip of color flies free. In addition to these critical first steps, the proboscis uncoils as two halves that fuse to form the drinking straw for nectar, sap, or other delicacies.

Adults have a different priority from the hungry caterpillars: to find a mate and reproduce. Females appear a day or two after the males, better assuring the chance of encountering males. Males and females locate each other sometimes in a realm that surpasses our human senses. For instance, butterflies can see ultraviolet light through eyes composed of hundreds of lenses watching in all directions (astronomers have mimicked the butterfly eye by clustering little telescopes interconnected by a computer). Males signal to females by sending flashes of ultraviolet light with each flap of a wing.

Most male butterflies rely on a predominant color of the female to identify her. Because their vision is not sharp, males will check out potential mates that can vary from a bluebird to the red shirt you are wearing. Lepidopterist Robert Pyle describes watching whites fly determinedly after flecks of waterfall foam and swallowtails chase a Frisbee. Males either perch (the loiterers) or patrol (the hyperactive fliers) in a quest for females. Sometimes they take a break in clusters for mineral meals, like the male blues I saw on the Selway.

Mating can last from minutes to hours, influenced by time of day and temperature. Eventually the male flits off in pursuit of another female, while the female must use her sense of smell, touch, and sight to find the proper egg-laying spot. Watch for an anise swallowtail above fennel or anise plants and you might be lucky enough to see her test the leaves with her feet, extend her abdomen downward and actually glue a spherical egg to a leaf.

If you were to experience smell and taste like a butterfly, you could hold a chocolate brownie in your hand and taste it, or brush up against a rose with your knee and sniff its fragrance. Butterflies have sensory organs scattered over their bodies. They taste not just with a proboscis and mouth, but through legs and antennae. Antennae also serve as a sort of nose. Butterflies hear, although not well, through the veins of their forewings.

IN MANY WAYS I AM CONTENT to admire butterflies for their sheer beauty alone. Yet, reading the words of butterfly experts and enthusiasts like Robert Pyle, Sue Hubbell, Jeffrey Glassberg, Miriam Rothschild, and novelist Vladimir Nabokov, I am compelled to burrow deeper, to visualize not just a wing, but the thousands of minuscule scales refracting and reflecting light.

Butterflies are the charismatic megafauna of insects. Just as the blues led me to the drab spiders, so can all butterflies guide us toward an appreciation of the perplexing maze of insect species all performing feats that we know have something to do with keeping this entire planet alive and well.

Across the country, people are starting to pay attention to butterflies as indicators of change. Adults pollinate flowers, caterpillars feed songbirds, and from there the relationships become much more mysterious. We do know that many butterflies have specialized habitats. When these habitats are bulldozed, logged, mined, or paved, butterfly species can disappear, sometimes forever, as in the case of the Xerces blue in the 1940s. The first American butterfly to become extinct, the Xerces blue's chosen home unfortunately coincided with burgeoning San Francisco.

We know there are fewer butterflies than before our civilizing impact began. One way to check the pulse of butterflies is to count them each year. Last year, there were a record 248 Fourth of July butterfly counts across the country. Similar to Audubon Christmas bird counts, the Xerces Society butterfly counts cover 15-mile-diameter circles. Counters not only note butterfly species, but habitat changes.

In Montana, schoolteacher and naturalist Byron Weber started the state's first count six years ago in the Bitterroot Valley, usually chalking up 35 or so species with the help of a handful of fellow pros. He hopes that other butterfly watchers will start more counts in other parts of the state to add to our limited knowledge. Nationwide, butterfly counts have doubled since 1990 .

It doesn't take a butterfly net to participate in counting or watching. Spending time observing a butterfly may reveal a truth about life capsulated in that bright flash of wings.

I'm ready to venture forth with my pocket *Golden Guide to Butterflies and Moths* in hand, binoculars over my shoulder, and excuse to meander. I may not even make it beyond the flowers in my yard, although I can see this new avocation as a ready reason to scale a peak in pursuit of something even finer than the summit itself. ■

KRISTI DUBOIS

MIKE LOGAN

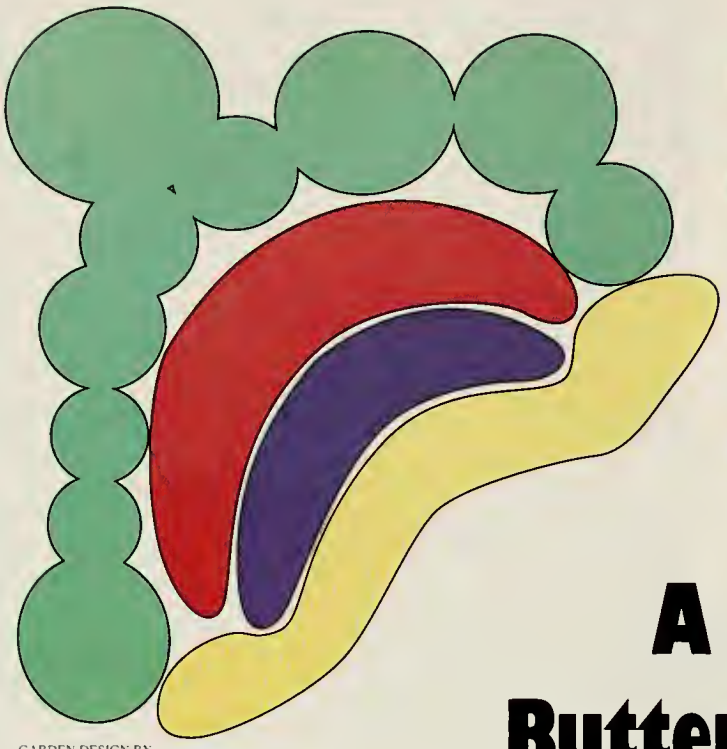
KRISTI DUBOIS

WALLACE HALEY

WALLACE HALEY

AL DEMANGELAERE

Counterclockwise from left: fritillary, western white, skipper, common sulphur, monarch, and Edith's checkerspot (center photo).



GARDEN DESIGN BY
ROCKY MOUNTAIN NATIVE LANDSCAPES,
MISSOULA, MONTANA

BACKGROUND PLANTING
Aspen, fruit trees, serviceberry, chokecherry, lilac, butterfly bush

TALL PLANTS
Hollyhock, flowering tobacco, four o'clock, coneflower, bee balm, cosmos, milkweed

MEDIUM PLANTS
Yarrow, daylilies, lupine, daisies, asters, liatris

LOW PLANTS
Lavender, marigolds, alyssum, sweet William, thyme, pussytoes

A Recipe for Butterfly Gardening

Creating a garden for butterflies takes only five ingredients and a handful of practical advice. As you learn the butterflies that frequent your area, you will gradually develop your own winning recipe. Try to include native plants as much as you can, since then you are mimicking natural habitats. Avoid spraying for pests; spraying eliminates the natural checks and balances in your garden and poisons the butterflies you are trying to attract. Finally, think about incorporating plants for birds as well as butterflies (see *Montana Outdoors*, July/August 1994).

1. FLOWERING PLANTS AND SHRUBS FOR BUTTERFLIES

- Mix flowers of different shapes, sizes, colors, and fragrance in more than one part of your yard. Stands of blooming flowers are best. Try to stagger your blooming seasons.
- Plant flowers with good, flat landing pads like daisies and yarrow. Avoid flowers with double ornamental blossoms. Clusters of flowers are good because they provide plenty of nectar in one place.
- Some flowers with long blooming periods that are easy to grow and find in Montana are: alyssum, cosmos, daisies, daylilies, gaillardia, larkspur, lavender, liatris, lupine, morning glory, sweet William, yarrow, and zinnias.
- Fragrant perfumes often entice butterflies more than delicate scents. Lilac, lavender, sweet alyssum, and viburnum all serve as butterfly magnets.
- Lupine is an excellent wildflower for attracting female blues in search of a place to lay their eggs.
- If you have a lawn, you'll be glad to have an excuse to leave a few weeds within the grasses: dandelions, clover, and speedwell.

2. FOOD PLANTS FOR CATERPILLARS

- Butterflies lay their eggs on stems and leaves that will become food for caterpillars. Try violets for fritillaries; thistles and asters for pearly crescentspots; fennel, parsley, and cowparsnip for anise swallowtails; and milkweed for monarchs.
- Willows are a favorite for certain caterpillars; adult mourning cloaks dine on the sap.
- Other food plants to consider include: asters, pussytoes, and thistles; grasses; alfalfa, clovers, lupines, locust trees, vetches, and wild licorice; hollyhocks and mallows; mints, including bee balm; chokecherry, hawthorn, serviceberry, and fruit trees; and aspen, cottonwoods, and poplars.

3. SUNNY PLACES

- Place a few flagstones in open areas (away from predators) for butterflies to draw in the sun's warmth or "bask."
- The sunnier your flowering garden, the better for enticing butterflies. Remember, they are cold-blooded.

4. WATER

- Butterflies need moisture in the form of wet sand or edges of puddles. Try burying a small, plastic basin in the soil near your basking rocks and filling it with sand. Then, keep it damp.

5. SHELTER

- Trees and shrubs near your sunny garden offer a refuge from storms, shelter from wind, nighttime roosts safe from predators, and food for caterpillars.
- Plant your hedge with butterfly favorites like lilacs (swallowtails love this one), mock orange, ceanothus, and chokecherry.
- Dense piles of twigs and brush sheltered from wind, rain, and snow provide secure places for overwintering varieties of butterflies.

The Forgotten Streams

by John Barsness

IT DIDN'T LOOK LIKE MUCH OF ANYTHING except a place for cattle to get a drink. It flowed through sagebrush, the banks barren and sandy. I was surprised when we walked up to the edge and you could actually see a couple of feet into the water.

"There are trout in there?" I asked. It might have been the third or fourth time.

Gene nodded. He owned the place. "Brown trout. Some of 'em pretty darn big." He pointed downstream toward one of the few patches of willows, a half-mile distant. "Down there, under the county bridge, my brother caught a four-pounder once."

DUSAN SMETANA

"Four pounds?"

He looked at me and smiled. "Not what most people call a four-pounder, you know, anything close to twenty inches long. We took this one into town and had it weighed at the post office. Four pounds, three ounces." He could see the doubt in my eyes, but he wouldn't say anything if I didn't. I didn't.

We split up. Gene headed downstream with his spinning rod, a few Mepps, and a small coffee can full of nightcrawlers. He never was convinced that you could catch anything on a bare lure, and always trailed half a nightcrawler from one of the hooks on his spinners. I headed upstream with my flyrod, along the bank, until I came to the corner post of the first corral.

It wasn't a pretty sight. The stream had eroded under the post over the years and rather than move the post, Gene (and his father before him) had thrown anything big and hard they could find onto the bank. There were wood-spoke wheels from old trucks, chunks of railroad track, and a door from a chrome-trimmed Fiftiesmobile, part sky blue and part rust red. I was about to crawl over the fence and continue up the stream, out where it flowed through pure sage and rabbitbrush, when I finally took my eyes off the junk and noticed the circular eddy behind the car door.

On the leader was a Humpy, or Goofus Bug, or whatever you want to call it, tied out of dirty white bucktail just off-color enough to imitate a pale morning dun. On the Bighorn or the Missouri or any spring creek it would fool no trout born before yesterday, and give any hatch-matcher a case of the dry heaves. But on forgotten streams a selection of vari-colored Humpies works just fine.

This was over 20 years ago, before the invention of that perfectly ugly, deadly fly called the Woolly Bugger. I had a weighted bucktail on my leader, a whimsical version of the Muddler Minnow that I'd tied after finding a single package of caribou hair down at the local fly shop. Designed especially for slow water, it also had some white marabou feathers, not only to attract trout but so I could call it the Marabou Caribou.

I pulled some line off the reel and tossed the Marabou Caribou into the far side of the eddy beside the door handle, let it sink for a moment, gave it one hard strip, then let it drift in the middle of the eddy. I could see it down there a foot below the surface, marabou wafting in the contrary currents. So I could also see the brown trout that swam deliberately up from under the door, like someone walking down the street to buy a newspaper. He (I still assume it was a he, because it had jaws as hooked as an osprey's) swam up and bit the Marabou Caribou at the same instant the paralyzed synapses in my arm raised the rod. I felt two hard bounces as the trout turned, trying for his home under the door, before the hook pulled out.

Actually, I suspect the trout just had it clamped in his jaws. He flipped his tail and disappeared. Thinking about it coolly, two decades later, I'd guess him as one of those close-to-twenty-inchers that people call four-pounders. By the time I met up with Gene again two hours later, we each had a couple of browns in the standard foot-long class. I told him the story of the big brown trout under the door and he said, "Oh, that's Herman. You must've throwed him something different. Nobody's caught him in a while."

THEY USUALLY BEGIN in limestone canyons, up in the mountains that touch the plains, some in the wall of tilted sediments we call the Rocky Mountain Front, some in the island mountain ranges scattered like an alpine archipelago in a sea of grass and sagebrush. They are the trout streams we have forgotten, because they don't flow near enough to airports, aren't big enough for drift boats, and their insects mostly fall from above.

Oh, up in the canyons you'll find some hatches, usually fastwater mayflies and some caddis. One mid-July day a friend and I fished one of the streams flowing out of the Belts. (Which Belts, you ask? Take a guess. You have a fifty-fifty chance of being right. This is not a fish-and-tell story.) We arrived at the old steel bridge early enough in the morning that long-sleeved shirts felt even better after we'd slipped into our fly vests, and nothing was rising. But as we stood on the bridge, finally vested and wadered, and looked down at the water, something got gulped down at the tail of the current.

We watched and soon saw a few pale morning duns floating down the stream. My friend was a new flyfisherman and unsure, insisting that I try first. Maybe he thought he'd learn something. Others have made the same mistake.

I didn't argue. Walking into the meadow next to the bridge, I circled far out from the stream, then eased into the water a hundred feet below the bridge. On the leader was a Humpy, or Goofus Bug, or whatever you want to call it, tied out of dirty white bucktail just off-color enough to imitate a pale morning dun. On the Bighorn or the Missouri or any spring creek it would fool no trout born before yesterday, and give any hatch-matcher a case of the dry heaves. But on forgotten streams a selection of vari-colored Humpies works just fine.

It took three casts, one to work out line, one to get the exact range, and the third to float directly over my memory of the rise. The trout came up and took it, as confident as a retired banker, and a minute later I netted a foot-long brown. My friend was astonished. I waved him down to the stream, had him tie a dirty-white Humpy on his tippet, and soon he caught a slightly smaller rainbow. He was even more astonished.

We fished for four hours, I think the first people to try that

DUSAN SMETANA

The hatches don't happen nearly as often out there, but if you study the ways of Woolly Buggers and grasshoppers, you will catch your share of close-to-twenty-inchers.

stretch of creek that summer, at least farther than 10 feet from the bridge with anything except nightcrawlers. Maybe 60 fish rose at our flies and we hooked half of them, keeping enough for dinner. There were browns and rainbows, a few brook trout, and a single cutthroat. The place I remember best flowed under the roots of a huge cottonwood, constricting the channel into a fast lick twice as deep as it was wide. There had to be a rainbow in there, somewhere. On my first cast something subliminal seemed to flash deep in the blue-black water, though I couldn't swear it wasn't sun-glint. On the second cast I could definitely see a silver-pink side turning. On the third cast a rainbow shaped like a slender halibut took the fly, coming out of the water on his way to his first jump. Or maybe it was a she. You just had to keep casting until they got the timing right. My friend caught that trout's twin on his second cast down the center of the lick.

I do not know exactly how to find such spots, except to keep driving the dusty gravel roads and keep asking the folks in the ranch houses in the shade of the cottonwoods. Over the years a number of them have gazed at me like they would look at Madonna if she knocked on their door, as if asking to fish instead of just doing it was behavior from L.A. or some other distant planet. I don't get that reaction quite as often these days, but it means more when it does show up.

Sometimes the limestone canyons reach so far back that you need to hike or ride horses to get there. The fish often grow larger up there than in the drivable places, perhaps because they don't get caught and eaten when "keeper" size.

(In the outback you will not often run into practitioners of catch-and-release, except to sort through the little ones until you have enough big ones to fry. On the other hand, you will not often run into many anglers, either.) All I know is that I have caught cutthroat-rainbow crosses from glacial streams up in the Front that would weigh four pounds if caught by a visitor to the Bighorn. In other words, close to twenty inches.

But the very largest trout live not in the mountains but farther out, in streams like my friend Gene's, where the water is about to turn catfish on you and the sagebrush is winning over the willows. The hatches don't happen nearly as often out there, but if you study the ways of Woolly Buggers and grasshoppers, you will catch your share of close-to-twenty-inchers.

Early in the season, as soon as the water begins to clear from runoff, Buggers work best. There doesn't seem to be a favorite color; I've used black, brown, green, white, and even gold chenille, with white marabou and orange tinsel mixed in. The paler versions seem to work better in the evening, probably because I see them better. Who knows? The trick is to find one of those winding, slow, deep-bellied streams where wader tracks are as rare as Mercedes and work that Bugger hard.

Prairie trout will take a Woolly Bugger any way you can fish it—that is, any way but dry. The choice depends on the current and depth. I usually carry a bunch of tiny split-shot, pinching them on just in front of the hook eye as needed. Around eddies and the edges of pools the plain old strip-pause works best. Under willows and cutbanks you have to toss it in there, let it sink, and give it one quick twitch, or cast downstream and bring the fly back slowly, just along the edge of the cover, letting it pause for long stretches. I have let a Bugger sit for as long as a full minute (not one of those close-to-twenty-inches minutes, but a real four-pounder) before the brown trout under the willow roots came out and smacked it.

JOHN BARSNESS

Or you can dead-drift Buggers down the deep runs, just like a nymph. The only problem in three-foot water lies in hooking the fish. The tendency is to jerk the rod upright while pulling on the line. Often there's so much upstream slack that the jerk (who, me?) just pulls the fly upstream, out of the trout's mouth. Instead, a quick downstream mend just as I set the hook catches many more trout, often in the classic corner of the jaw.

But hopper season is the real time out on the prairie. One August my wife and I were fishing one of our favorite streams out in the Judith Basin, along some rosebushed cutbanks where we knew large browns liked to swim. I was on one bank, Eileen on the other, and I had finally given up on the inside of one big pool while, across from me, she dapped her Pheasant Hopper on the deep flow just below the wild roses. I'd just made my first cast in the next pool upstream when I heard her shout and turned just in time to see her haul a close-to-twenty-inch brown trout straight up out of the water and into the rosebushes. We habitually use tippets in the 10-pound class for hoppers, but this was ridiculous.

I could see the roses whipping around where the fish had disappeared, as if a fox was chasing after a rabbit down there. Eileen dropped her rod and crouched, then pounced like a fox just as the fish did a double backflip and landed in the edge of the roses. She got him by the tail, but that wasn't enough and he flipped into the water again.

"Damn!" she shouted. She is one of the three most predatory people I have ever known, and nothing makes her madder than to actually lose a fish from between her fingers, except maybe have a whitetail jump the fence before she pulls the trigger. "To hell with you, trout!" Then I could see her sigh and start untangling her leader from the rose thorns.

"Hey!" I shouted. She looked up, not exactly an angel of sunshine and light. "You were gonna release him anyway."

"So what?" she called back. I started fishing again. By the next pool she would be happily predating again.

Grasshopper season sometimes begins in July, and I have caught them on hoppers into early October, but August is prime time. Despite what the locals do, bend your barbs down gently, as much to keep them from sinking into your tender earlobes when you jerk the fly out of the rosebushes as to gently release the fish. And then release all the "four-pounders," because even though they grow more quickly than up in the glacial mountains, there are not so many as in the Bighorn. But don't feel guilty about keeping two or three of the smaller fish for supper.

Just treat the forgotten streams gently, taking only what they can afford, and they will treat you just fine, right back. And if you are the sort of angler who likes an audience when you catch a big fish, stick to the Bighorn, because nobody will be watching you here. ■

Spirit of the Front

EAR MOUNTAIN WILDLIFE MANAGEMENT AREA

by BRUCE AUCHLY and QUENTIN KUJALA

TO UNDERSTAND Ear Mountain Wildlife Management Area (WMA) is to understand the East Front of the Rocky Mountains. All of the Front's wonders and worries, programs and problems, are there in microcosm.

West of Choteau, hunkered down in the shadow of its namesake, Ear Mountain WMA offers spring habitat for bears, an autumn spot for deer hunters, and winter range for mule deer and bighorn sheep. Livestock operators lease the WMA for grazing. The area also provides one of the few access points to federal land along the Front.

Despite its importance, 3,047-acre Ear Mountain WMA often gets overlooked. Call it the twin towers effect. To the north sits the 10,397-acre Blackleaf WMA in a hunting district prized for late-November trophy mule deer hunting. Off to the south the Sun River WMA, at almost 30,000 acres, provides winter range for elk coming out of the Bob Marshall Wilderness.

The Rocky Mountain Front has been valued by humans for centuries and by wildlife for even longer. When geological forces crunched plains into steep mountain slopes, nature created incredibly diverse habitats in a small area. Ear Mountain WMA climbs from stream bottoms to limber pine/grassland, through aspen, lodgepole pine, and Douglas-fir stands, up to rocky scree. Elevations range from 5,100 to 6,500 feet, with more than half the WMA higher than 6,000 feet. Heavy snows can accumulate up high, but fierce winds blow lower grassy elevations clear, creating suitable big game winter range.

Montana Fish, Wildlife & Parks (FWP) bought Ear Mountain WMA in 1976 primarily to provide access to federal lands along the Rocky Mountain Front, but also to set aside winter range for mule deer and bighorn sheep. The property's potential bear habitat figured prominently in the purchase. Other human and wildlife uses of the WMA now occur, but the original purposes remain paramount.

DAVE MCGEE

Ear Mountain WMA provides winter range for mule deer (right) and bighorn sheep as well as important spring habitat for black bears (oppposite page) and grizzlies.

A glance at a map of the Front reveals that south of the Teton River, Ear Mountain WMA is the closest guaranteed access to federal lands. About 15 miles farther south lies the next public access through the Sun River Canyon.

As for winter range, during the winter helicopter survey of 1992, nearly 400 mule deer were observed on and around the WMA. That's a big reason why a dozen or more vehicles can be found parked at the trailhead on the last weekend of big game hunting season.

Shortly after the department bought the WMA, 35 sheep were transplanted there. "By 1980 the population was 80," says FWP wildlife biologist John McCarthy. "Then a die-off took place in 1983 and 1984 all along the Front, probably even in Canada."

Since the die-off, sheep numbers have stabilized at about 30 animals. McCarthy says it's unclear why the sheep herd has not increased much in the last 12 years. "For some reason, it was probably knocked down to where accidents or predators are taking young and adults so the population can't expand."

Transplanting more sheep is not an option currently, says McCarthy. That's because there are few spots now with a surplus of bighorns, especially for places like Ear Mountain that already have a steady population. And using sheep from nearby, like the Sun River Canyon, won't work because the transplants would probably just return to their original area.

Then there are bears. Both grizzly and black bears use the WMA in mid to late spring. Typically, grizzlies emerge from their mountain dens in April and May and head to lower elevations next to streams—called riparian areas—along the Front. Just out from the Front on the prairie, Pine Butte Swamp, owned by The Nature Conservancy, is such a riparian area. The reasons are simple. In early spring, bears look for anything green to eat or even carcasses of winter-killed animals.

First to "green up" are spots near open water, whether the Teton River, one of its many forks, or Pine Butte Swamp. Later in spring, bears, especially grizzlies, follow the green-up from Pine Butte into the mountains. With its 5,100- to 6,000-foot elevation, Ear Mountain WMA provides a perfect gateway. Its aspen groves and lush spring vegetation were made for grizzlies.

"Grizzlies move up the North Fork of Willow Creek from Pine Butte Swamp to Ear Mountain," says Mike Madel. FWP's bear management specialist based in Choteau. In early spring, grizzlies often rest during the day in the aspen groves and graze at night on plants such as cow parsnip and angelica. Springtime densities of grizzly bears in the Ear Mountain-Pine Butte area are among the highest along the Front.

To help keep grizzlies, and black bears, too, from tangling with local ranchers, Ear Mountain WMA is part of a carcass redistribution program. As mentioned above, animal carcasses, both wild and domestic, are a staple of bears' early spring diet. Ranches often have a "boneyard," a place where livestock carcasses are dumped. Bears, with their keen sense of smell—and strong stomachs—are inevitably drawn to these areas, creating a problem for all parties. To avoid up-close-and-personal contacts between bears and

people in the spring, FWP disperses livestock carcasses at backcountry sites along the Front, including Ear Mountain.

Because both bear species are often in the WMA when the females are in estrus (May to early July), Ear Mountain is an important breeding area. "Black bears use Ear Mountain just as much as grizzlies," Madel says. "In fact, black bears use it much more on a year-round basis."

After the WMA opens on May 15, black bear hunters head there, though Madel says they need to be aware of grizzlies. "The black bear hunters I've sent up there say, 'Gosh, all I saw were grizzlies, and I got out of there.'"

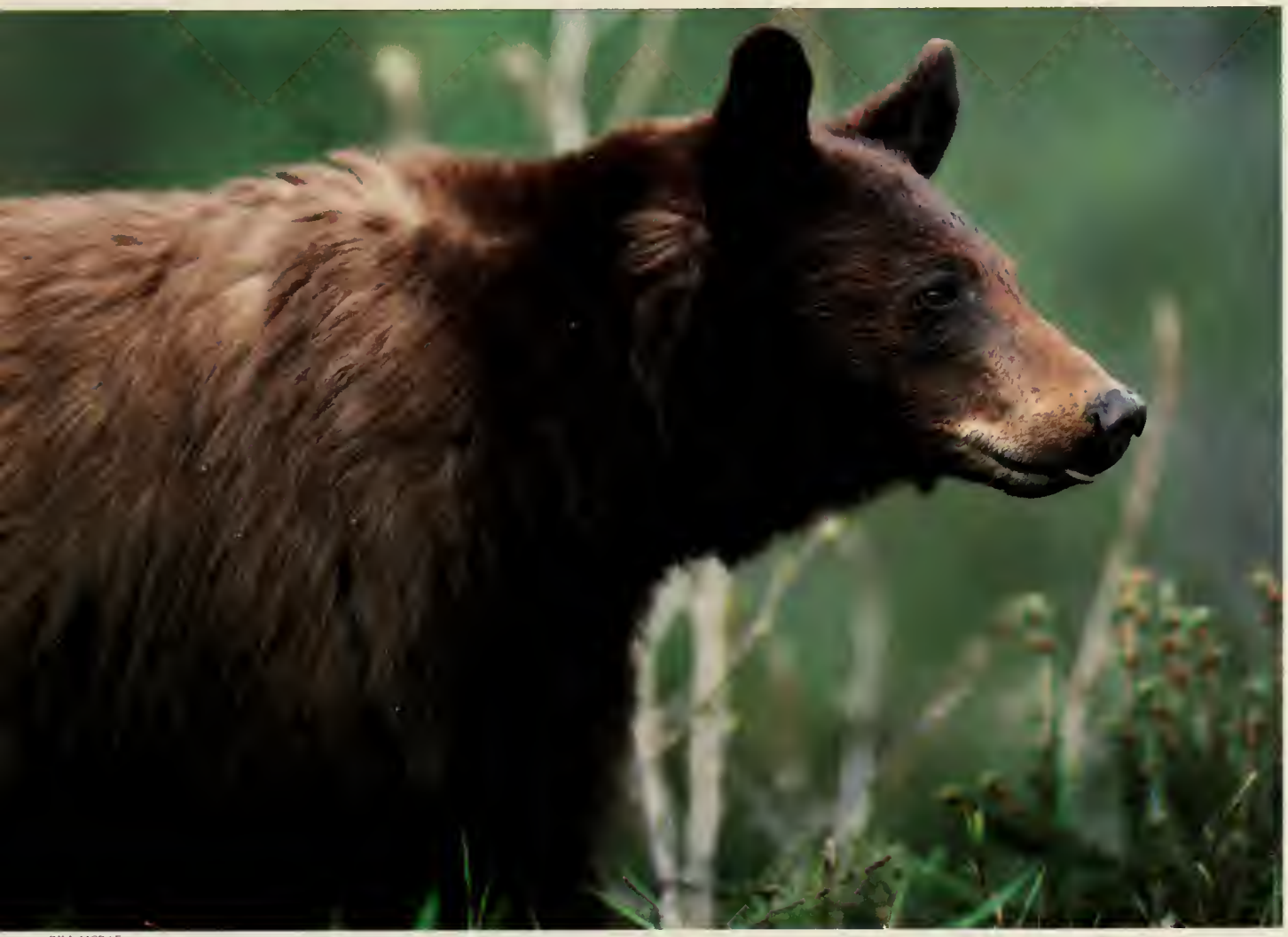
Nonhunting uses in late spring, summer, and early fall include hiking, horseback riding, wildlife viewing, and just enjoying the scenery. Ear Mountain itself, which is not part of the WMA, can be reached from the management area, although one need not climb to the 8,380-foot summit to enjoy a panoramic view of the prairie to the east and island mountain ranges like the Sweetgrass Hills, Highwoods, and Little Belts.

Prehistoric human use of Ear Mountain WMA probably dates to B.C. 10,000. Archaeologists believe ancient peoples traveled north and south along the Rocky Mountain Front using the Old North Trail, a well-worn path still visible in spots. Portions of the trail lie just east of the WMA boundary. In addition, the summit of Ear Mountain, rising just west of the WMA, was a vision quest site for Indians.

A 1993 archaeological survey of Ear Mountain WMA, however, found just one prehistoric rock cairn, or rock pile, probably used as a landmark. Still, with the WMA sandwiched between the Old North Trail and a vision quest site, it's not a great leap to figure prehistoric travelers tramped across the WMA's rolling foothills.

Most people today visit Ear Mountain WMA to hunt. The property is open throughout the archery and general hunting seasons for deer (mule and white-tailed), elk, bighorn sheep, black bear, and grouse (ruffed, blue, Franklin's, and sharp-tailed). Elk are a recent and growing addition to the WMA, at least in huntable numbers. Although a few bulls usually wintered there in past years, elk use of the WMA has increased and so has their use of Pine Butte Swamp. In March of this year, 82 cows, calves, and spikes were spotted just east of the WMA.

When the WMA was purchased in 1976, it showed signs of serious overgrazing. Some of that evidence is still apparent today and will be for



BILL MCRAE

some time. With the exception of a portion of the northeast corner used briefly to graze FWP horses, grazing on the WMA was essentially eliminated for 15 years. During that time, plant communities recovered significantly. Areas that maintained adequate soil conditions recovered to the point where they could again be safely grazed. To that end, livestock grazing was resumed in 1991.

The WMA is now divided into two large pastures, one of 2,000 acres and the other 1,000 acres. The larger of the two lessees, the Saypo Cattle Company, also has a rest-rotation system with the Bureau of Land Management that involves about 18,000 acres. With the FWP pasture, that comes to just over 20,000 acres of rangeland managed in a rest-rotation system similar to those used on several FWP wildlife management areas.

There are several reasons for allowing livestock grazing on Ear Mountain WMA. First, grazing during summer helps produce good range conditions for elk and deer in winter. Cattle keep the rough fescue grass from becoming "wolfy" and building up too much residual cover from previous years' growth. Second, if cattle are allowed into an area after grasses have gone to seed, their trampling helps disperse the seeds. Finally, FWP "helps" the Saypo-BLM system by further dispersing grazing pressure, wild and domestic. Livestock respect fences; wildlife do not. Deer and elk go where they want to. Spreading grazing pressure over a larger area can help create more areas and better pasture for wildlife.

To monitor the impact of grazing on the WMA, FWP biologists have set up several permanent and temporary exclosures. As the names imply, the permanent fences allow monitoring of trends over long periods, while the temporary exclosures provide quick, one-season snapshots. The grazing system thus far appears to have had a positive impact and, at the very least, range conditions will be maintained at current levels.

Just what is it that makes Ear Mountain WMA so special? The answer is alive. It endures before us today just as it did with humans centuries ago. It is an answer of images: A grizzly ambling through an aspen grove on a spring evening, a bighorn sheep toughing out the winter on a windswept slope, and a young hunter shouting with joy over that first autumn buck. It is the spirit of the Rocky Mountain Front as seen from Ear Mountain WMA. ■

EAR MOUNTAIN
WILDLIFE MANAGEMENT AREA

Location: In western Teton County, 22 miles west of Choteau, 75 miles northwest of Great Falls.

Size: 3,047 acres.

Acquisition date: 1976.

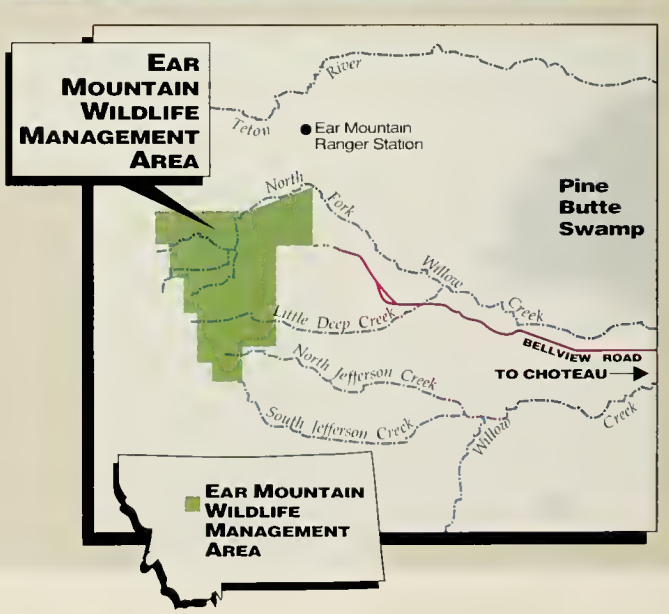
Access: From State Highway 287 one-half mile south of Choteau, turn west on Bellview Road (at Pishkun Reservoir sign). Continue past turnoff to Pishkun Reservoir (about 5 miles out) and proceed roughly 17 more miles to trailhead on WMA's eastern border. There is no vehicular access inside the WMA.

Management goal: To provide wildlife habitat for mule deer, bighorn sheep, grizzly bears, and black bears, and access to public lands along the Rocky Mountain Front.

Hunting opportunities: Archery and gun seasons for white-tailed and mule deer, elk (see regulations for details), black bear, and grouse are open to licensed hunters. Permits are required for bighorn sheep hunting.

Wildlife viewing: Elk, mule and white-tailed deer, bighorn sheep, black and grizzly bears, raptors, and songbirds can be found through much of the year. The WMA is closed to all visitation from the end of the big game hunting season until May 15 each year.

QUENTIN KUJALA



TROUBLE
in Trout Paradise

by Tom Palmer

On the first day of winter in 1994 Beth MacConnell peered into her microscope to find a deadly parasite in the tiny bones of wild rainbow trout taken from the Madison River.

MacConnell, a research biologist for the U.S. Fish and Wildlife Service's Fish Technology Center in Bozeman, examined the heads of 27 small rainbows at the request of Montana Fish, Wildlife & Parks. For more than three years FWP fishery biologists Dick Vincent and Mark Lere had tracked the baffling downstream progression of a wild rainbow trout population crash. From one year to the next it seemed that the Madison River's renowned rainbow trout were being systematically sucked from the river and into the void. MacConnell was called on to determine the unthinkable—were the wild rainbow trout in Montana's most revered trout stream victims of an epidemic?

By December 21, 1994, from the cold waters that rush from the mouth of Quake Lake to beyond the cobbled meanders of the serene fly-fishing town of Ennis, more than 100,000 rainbow trout had vanished from one of the most celebrated trout-fishing rivers the world has ever known. The odd thing was the river's brown trout were left unaffected, making the rainbow trout removal seem almost surgical.

"The Madison River has always been as good as it gets," Vincent says a little sorrowfully but with no despair. This is, after all, the Madison River. A 90% decline in rainbow trout is a headlong population crash by any measure, but on the Madison the crash hasn't come close to a total wreck. Even after the crash, the Madison's trout populations compare favorably with trout numbers in the famed Big Hole, Yellowstone, and Gallatin rivers, but there is no mistaking that the Madison River mystique has been tarnished.

"It's the kind of river that people thought would always be there," Vincent says. "Maybe that's not true now. There is something that can alter it."

DUSAN SMETANA

U.S. Fish and Wildlife Service researcher Beth MacConnell.

The microscopic parasite MacConnell found causes whirling disease, an illness that affects the bone-forming cartilage of trout and salmon and one that can be particularly deadly to rainbow trout. For years the ailment's ultimate consequence—deformed or dead fish—was thought to manifest itself primarily within a hatchery's closed system. Today, while debate rages, fishery biologists throughout the West are now fingering whirling disease in a number of trout population crashes in the wild.

The disease is named for the characteristic tail-chasing in young, infected fish. The whirling can result in starva-

tion because infected fish can't seem to right themselves to feed normally and, especially in the wild, the bizarre motion is widely believed to make a fish extremely vulnerable prey.

"Whirling disease may not be the end killer," Vincent says. "The bottom line is, the disease could be stressing the fish to the point where it can't survive in the wild."

The illness is a baffling one caused by one of the oldest and most puzzling life forms on earth. Scientists know the protozoan as *Myxobolus cerebralis*, a parasite whose Greek and Latin names roughly translate to "lumpy head."

At the onset of infection, a virulent amoeba-like form of the parasite invades a trout's body through the skin, gills, and any number of other openings. This naked, multi-celled creature is carried via the nervous system to eventually settle in the cartilage of young trout.

This in itself is highly unusual, says MacConnell. "Most infectious organisms are found in vascular tissue—like the liver or kidney—that carry blood, oxygen, and nutrients. Cartilage is avascular, it has no blood vessels, so it carries no oxygen."

MacConnell and others believe, however, that the parasite somehow obtains nutrition from the cartilage. "Cartilage is living tissue," she says. "The organism is getting nourishment from the tissue, but nobody knows how. It's unusual and it suggests that we're dealing with a very, very tough critter."

In the worst cases, a wave of infectious cells washes up in various areas around the trout's head, where abundant soft cartilage is found. Over the next three to four months the odd invader excretes an enzyme that destroys cartilage in a manner that eventually produces deformed bone.

One would assume that with a young fish's neural passageways so damaged and crisscrossed, that alone would be enough to cause a fish to swim in circles. But as with almost everything associated with *M. cerebralis*, there is nothing obvious about it. Researchers now believe that pressure applied to the nerves that control equilibrium causes a fish to chase its tail. The pressure is created not by the invading organism, but by the fish's immune response to the invasion. In its attempt to battle the parasite, the trout's immune system sends a legion of cells to the area of infection. It is this horde of immune cells that squeezes the nerves in a manner that causes a fish—and particularly a startled fish—to swim in erratic, listing circles.

The brown trout's immune response to the parasite is apparently more effective. Brown trout immune cells quickly smother the invaders to stop their growth. Many researchers surmise that because European brown trout evolved side by side with the Old World parasite, the brown trout has had centuries to adapt to the creature's tormenting ways. But even that is just educated conjecture.

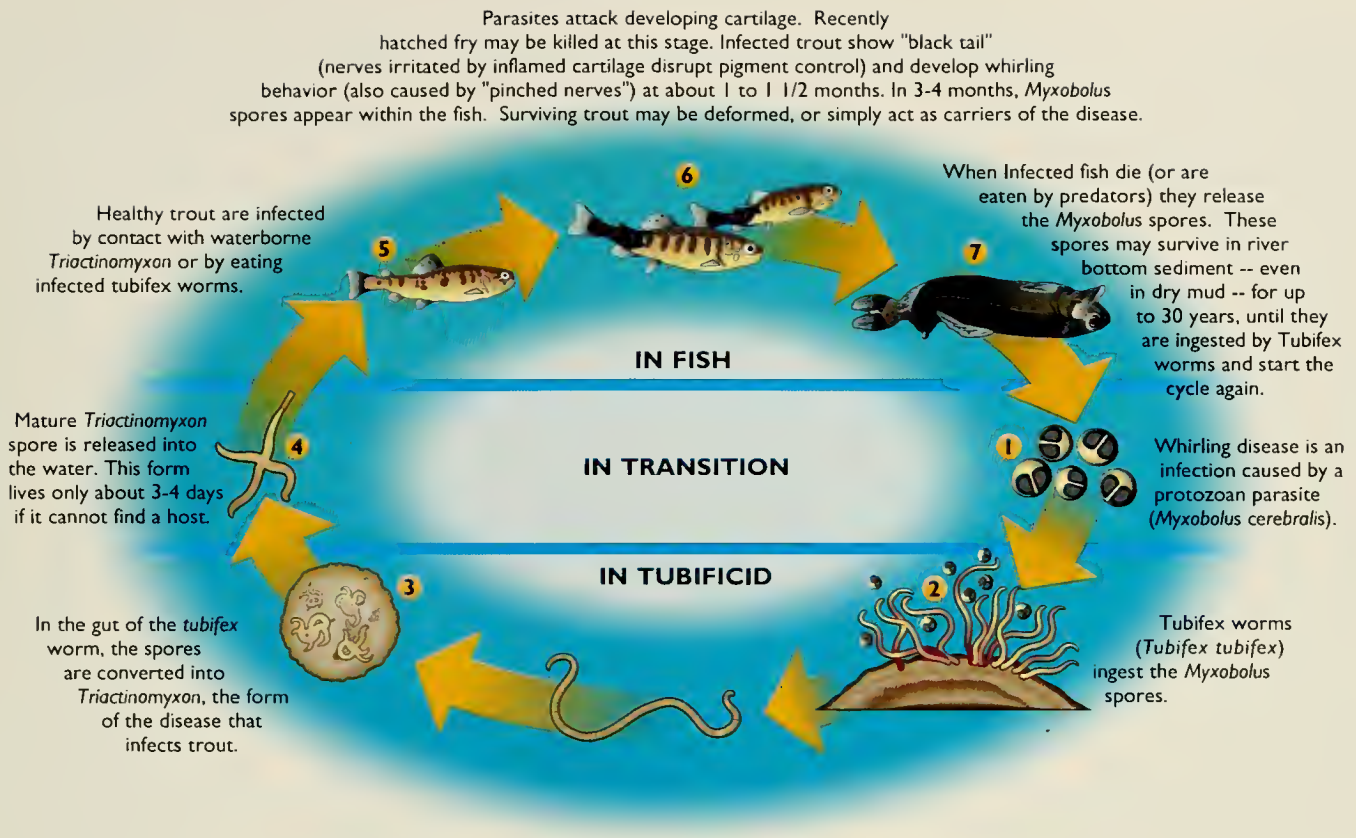
In any case, many infected fish, be they rainbow or brown trout, won't whirl. "It depends on the area of infection," MacConnell says. Hatchery-reared trout that have survived serious infection often carry with them the clinical signs of the disease, including disfigured heads, crooked jaws, snub-nosed snouts, twisted spines, and the charred black tails that tend to imply a thoroughly french-fried nervous system. Each deformity is a direct indication of the hub and degree of infection. Since December of 1994, MacConnell has examined more than 570 fish taken from Montana waters. She has confirmed the presence of the disease in wild rainbow and brown trout from several streams—including the Ruby River and Poindexter Slough, both primarily brown trout havens.

Like Vincent, MacConnell suspects that in the wild few infected fish are hardy enough to ward off the illness and simultaneously endure the exacting demands of nature. Yet it is well known among parasitologists that in the Kingdom Protista, Phylum Myxozoa, Class Myxosporea, Order Bivalulida, and Family Myxobolidae, there are some 1,300 species of myxosporeans that seek fish,

How You Can Help Prevent the Spread of Whirling Disease

Montana Fish, Wildlife & Parks, in cooperation with Governor Marc Racicot's Whirling Disease Task Force, urges anglers, boaters and others to help prevent the spread of whirling disease in Montana by following these precautionary routines after enjoying a day on the water.

- Thoroughly check your vehicle, boat, anchor, trailer and axles, waders, boots, and fishing gear for mud and aquatic plants that could be holding tubifex worms and whirling disease spores. When you find mud or aquatic plants clinging to your equipment, wash or scrape them off before departing the fishing access site.
- Drain your boat and equipment of all water. The parasite may be present in water in your boat, cooler, bait bucket, or live well, and could travel with you from place to place. The whirling disease parasite is smaller than a grain of sand, so even water that appears normal may be harboring the parasite. Make every effort to dry and drain your boat and equipment after each river trip.
- Do not transport fish from one place to another. In Montana, it is illegal to move fish from one water body into other waters.
- Dispose of fish entrails, skeletal parts, and other by-products in a proper refuse receptacle. It is illegal to dispose of fish entrails in Montana's streams, rivers, and lakes.
- The collection of sculpins (also known as bullheads) and the use of sculpins as bait are prohibited in Montana. The sculpin ban came as an emergency precaution after sculpins taken from the Madison River were found to be carrying spores that resemble spores that cause whirling disease in trout.


Parasites attack developing cartilage. Recently hatched fry may be killed at this stage. Infected trout show "black tail" (nerves irritated by inflamed cartilage disrupt pigment control) and develop whirling behavior (also caused by "pinched nerves") at about 1 to 1 1/2 months. In 3-4 months, Myxobolus spores appear within the fish. Surviving trout may be deformed, or simply act as carriers of the disease.
STUART ARMSTRONG
Healthy trout are infected by contact with waterborne Triactinomyxon or by eating infected tubifex worms.
When Infected fish die (or are eaten by predators) they release the Myxobolus spores. These spores may survive in river bottom sediment -- even in dry mud -- for up to 30 years, until they are ingested by Tubifex worms and start the cycle again.
IN FISH
IN TRANSITION
IN TUBIFICID
Mature Triactinomyxon spore is released into the water. This form lives only about 3-4 days if it cannot find a host.
Whirling disease is an infection caused by a protozoan parasite (Myxobolus cerebralis).
In the gut of the tubifex worm, the spores are converted into Triactinomyxon, the form of the disease that infects trout.
Tubifex worms (Tubifex tubifex) ingest the Myxobolus spores.
1
2
3
4
5
6
7

Life Cycle of Whirling Disease

but only a handful cause disease and fewer still kill their hosts.

"You have to remember," MacConnell says, "that this disease has to do with the host, a pathogen, and the environment. If any one of those things tips the balance, you have disease. Maybe there's more sediment in the streams. Maybe there are any number of things working in combination with the pathogen and the environment to affect the trout populations. There is just so much we don't know."

Meanwhile, over the three months following a trout's initial infection, the parasite grows as it devours cartilage. About the time the fish's cartilage hardens to bone, the infectious parasite goes to seed to become hundreds, or thousands, or millions of inert spores. About 300 of the tiny seed-like spores could comfortably fit on the head of pin. Researchers have found more than a million spores in the minuscule heads of minnow-sized trout. MacConnell says the degree of infection in the Montana trout she has examined ranges from mild to severe.

It is at this stage of its strange life cycle, when the microscopic spores can be identified within the tissue of the fish, that the parasite enters a state of suspended animation. No longer infectious to trout, the lifeless spores become entombed within their host's hardened bone.

Confined within an infected fish, the spores remain dormant and remarkably resistant to damage. Spores encased in trout bone can survive freezing, the rapid passage through the digestive system of a bird, and the slower digestive processes of mammals. While the spore can even survive the salty-brine marinade used to prepare the common angler's favorite delicacy—smoked trout—it won't survive the actual smoking. The spore—which is harmless to humans—can be destroyed by cooking the fish at 140 degrees for 10 minutes.

In the natural environment, once liberated from a trout's bone, the spores can survive for decades in streambed mud. "It's what we might call a very successful organism," MacConnell says.

Myxosporea—the protozoan family that counts *M. cerebralis* as a hearty, persistent member—has been known for more than 90 years, but scientists still acknowledge that they have yet to get a sure read on most of the members' life cycles. The radical gyrations of *M. cerebralis* suggests why myxosporea pose such daunting challenges.

Consider that the profuse *M. cerebralis* spores do not reenter the riverine environment until an infected fish dies. With the decomposed carcass—or from the waste of a predator or scavenger that fed upon an infected fish—comes the release of spores and their streambed settlement where they are eaten by *Tubifex tubifex*.

T. tubifex is cousin to the common earthworm, but it squirms out an existence on the muddy bottom of nutrient-rich (some might say polluted) waters. The worm is about an inch long and as thin as fine thread. It cannot swim. It has no eyes. So it probably does not actually seek *M. cerebralis*, but eats it inadvert-

ently as it sucks up stream-bottom mud peppered with the spore. The bottom of a streambed may contain thousands of tiny organisms that also consume the spore, and there are more than 60 different tubificid worms known to exist in the world—and an unknown number known to exist in Montana—but to complete its life cycle, it seems that *M. cerebralis* must be consumed by *T. tubifex* and only *T. tubifex*.

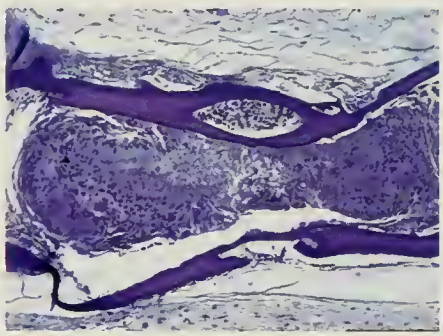
For Montana, and especially the Madison River, this too provides an odd twist to the whirling disease mystery. Ecologists know tubificid worms as "sludge worms," specially adapted to a burrowing life in what can best be described as muck. They suck up mud in a continuous garbage-in garbage-out fashion to glean the bacteria that sustains them. It has been generally accepted that if tubificids are found in rock-cobbled streams, they will be found in places where substantial organic debris is deposited to form a bacterial sludge on the streambed. It hardly sounds like the clear, rapidly flowing Madison, but of all the tubificid worms known to exist, *T. tubifex* appears to squirm quite happily in its enthusiasm for both the most harshly polluted environments and clean, clear waters.

"The gray area here is just huge," MacConnell says. "The more we look the more myxosporidia we find. We know of 56 different species in the genus *Myxobolus*. Does that mean we have a different worm for all 1,300 myxosporeans?"

The question is an important one because within the gut of the worm, *M. cerebralis* reacts with an enzyme that serves to open the once-obstinate spore like a welcoming clam. Once the spore is open, a new multi-celled organism ascends from it and migrates into the lining of the worm's gut.

Within four months something extraordinary occurs. The organism undergoes another transformation, bolts from the gut lining in the form of a new spore, and makes its way back to the gut itself. This mature spore is a willowy, three-armed creature the worm pumps from its gut by the hundreds for months on end. The new spore—which is presently known as *Triactinomyxon gyrosalmo*—is far from dormant. It is often compared to a minuscule grappling hook that emerges from the mud to be swept downstream, where it has about 96 hours to latch onto a trout. Once grappled to a fish, *T. gyrosalmo* injects into the fish the virulent, amoeba-like form of the parasite that eventually settles in to devour the trout's cartilage.

T. gyrosalmo is hundreds of times smaller than a newborn baby's eyelash. One thread-thin tubifex worm, at the peak of productivity some four months after its initial exposure, can carry 1,000 of these delicate grappling hooks in its gut. And, unfortunately for trout, they are cranked out with Gatling-gun aplomb.



BETH MACCONNELL

This tissue section from the head of a Madison River rainbow trout (magnified 400X) shows cartilage destroyed by M. cerebralis *(spores are in center of photo).*

Since 1899, members of the family Actinosporea—the taxonomic umbrella that covers *T. gyrosalmo*—have been known to be worm parasites, while those of the family Myxosporea have been known to be fish parasites. It wasn't until 1983 that the elegant research of two now-retired U.S. Fish and Wildlife Service scientists revealed that "in at least one situation, an actinosporen and a myxosporen are not separate entities."

The one situation, they said, results in whirling disease.

When Ken Wolf, a USFWS senior research scientist, and Maria E. Markiw, a research microbiologist, announced that *Triactinomyxon* and *M. cerebralis* were different forms of the same parasite, the discovery raised eyebrows among parasitologists all over the world. With some understanding of how the inner circles of parasitology would react to their incredibly titled 1984 *Science* magazine article, "Biology Contravenes Taxonomy in the Myxozoa: New Discoveries Show Alternation of Invertebrate and Vertebrate Hosts," Wolf and Markiw argued that their "explanation of the myxozoan life cycle should not be considered radical."

They had reason to soften the impact of their discovery. Wolf and Markiw had been neck deep in whirling disease research for about 10 years when their rigorous processes of elimination revealed a biological phenomenon that had eluded classically trained parasitologists for almost a century. Their work showed that two distinct creatures emerging from the bellies and bones of two different animals in radically different forms were not two creatures at all, but one and the same. In a quick climb up the evolutionary tree, a parallel claim would be that a coyote and mountain lion are different forms of the same animal. Jump down and picture mangos growing from an apple tree.

"It was a revolutionary discovery," MacConnell says. "Imagine telling the scientific community that two separate and distinct parasites are the same thing. That's why it wasn't accepted."

When it comes to whirling disease, the arguments are liable to continue because, at least for now, the unknown trumps science—a point that engenders serious worry among those who envision wild trout management dogma being thrown to the wind.

"It used to be that wild trout management was the best, the cheapest, and most efficient way to manage a fishery," says Larry Peterman, chief of FWP's Fisheries Division. "If you had good habitat, you could have good wild trout populations. That's what our science showed, but it's no longer a given. You need good habitat and you have to learn how to manage with disease in the environment."

It is the rueful notion that Montana's wild trout philosophy is but a house of cards that can be undermined by an invisible spore that most troubles Dick Vincent. "It's a frustration on one hand, but challenging on the other," he says, weighing his words, his understanding of the Madison River, and his own attachment to what the river has become. "This shows you the fragile nature of what we're dealing with. There will be no quick fixes. We have to be patient, because if we panic, we may never recover the Madison River's wild trout." ■

A new plan for
Montana's Trails

ontanans love to hit the trail. With 14,633 miles of designated trails in the state, there are lots of options: Montanans can backpack into the Beartooths, snowmobile around West Yellowstone, hike through Glacier, take pack horses into the Bob Marshall, cross-country ski at MacDonald Pass, ride off-highway vehicles to scout favorite hunting areas, and bike the riverfront trails in Missoula, Great Falls, and Billings.

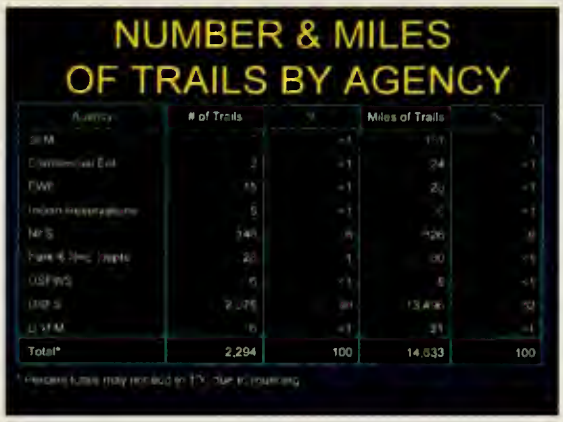
Trails are a resource Montanans feel passionate about, and, as with many other important resources, we don't always agree on how they should be managed. Inevitable differences of opinion can sometimes cause tensions between various trail users—but disagreeing *respectfully* about something we feel strongly about is not necessarily a bad thing.

In the midst of these varying viewpoints, Montana recently launched a process to develop a comprehensive, statewide trails plan. This planning process represents a first attempt to step back and examine the entire Montana trail system and to assess ways of improving the network. The Montana Trails Plan will address both summer and winter trail activities, as well as motorized and nonmotorized uses.

In conjunction with the trails plan, an environmental impact statement (EIS) will be completed. In general, the plan is intended to include statewide policy and management recommendations, while the EIS will be more of a technical document assessing the impacts of state-administered trail grant programs.

The federal, state, and local agencies that manage trails in Montana all have their own trail planning processes, policies, and regulations. The state trail system as a whole, however, transcends agency boundaries, and needs to be examined from a wider perspective to see how the pieces best fit together. For example, someday it may be possible to get on a city trail near your home, take it to a state park or Bureau of Land Management (BLM) trail on the edge of town, and finally get on a U.S. Forest Service trail traversing the higher country farther out, all without having to use your car or leave the trail. Some opportunities like this already exist in Montana, but there is much room for improvement.

by **Jeff Erickson**



Although 98% of Montana's trails are on federal land, the remaining 2% are extremely important because of their proximity to cities and towns.

DIANE ENSIGN

The Montana Trails Plan will not usurp the planning processes used by the different agencies that manage the state's trails. Rather, it is meant to provide managers with information about the trail system and the people who use it, and to produce statewide recommendations on trail issues and needs. The plan will include information on trail supply and demand; trail system gaps and potential trail corridors; existing management practices, plans, and policies; goals, objectives, and strategies for addressing trail issues; impacts of trail use and potential mitigation; and trail funding priorities.

verview

The impetus for a statewide trails planning effort initially came from the 1993 State Comprehensive Outdoor Recreation Plan, which listed a trails plan as one of Montana's most pressing recreational needs. Completion of the plan is also required to maintain Montana's eligibility to receive National Recreational Trails Trust Fund money. As the agency with primary statewide recreation planning responsibilities, Montana Fish, Wildlife & Parks (FWP) is taking the lead in preparing the plan, but all the involved agencies are equal partners in the process.

Two advisory committees will assist FWP with plan development. One group—the State Trails Advisory Committee—is composed of representatives from the major motorized and nonmotorized user groups. The other, the Trails Plan Advisory Committee, includes representatives from agencies that manage Montana's trails and other interested groups.

Two research projects related to the plan were recently completed by the Institute for Tourism and Recreation Research at the University of Montana. In 1993 and 1994, Institute personnel surveyed adult Montanans to assess summer and winter trail use and to gather information on trail preferences, use patterns, and user conflicts. In addition, they conducted a comprehensive inventory of all 2,294 designated trails in Montana that included data on location, length, elevation range, and prohibited uses.

Following the trails inventory and surveys, public workshops were held around the state last November and December to identify issues to be addressed in the plan. During the next year, goals, objectives, and alternative strategies will be developed to address the issues trail users and advisory committee members identified as being high priorities. The draft plan and EIS are scheduled for completion in 1996, followed by a public comment period. The intent is to have the Montana Trails Plan completed by the time the next legislature convenes in early 1997.

Vision

Trails Plan Advisory Committee members have written a draft vision statement to help frame the Montana trails planning initiative. The draft should be viewed only as a starting point for thinking about what statewide trails planning might accomplish in Montana. According to the vision statement, a quality trail network for Montana should contain or reflect:

A diversity of opportunities...for people of all ability levels with facilities for a wide range of users, including those with disabilities.

A variety of settings...that showcase the diversity of the state's natural and cultural environments, from urban to wilderness, forest to prairie, mountaintop to river valley, and ghost town to busy city center.

Minimal conflicts...among users, as well as between users and nonusers.

Interpretation and education...to allow users to experience and learn more about the state's natural and cultural features.

Conservation measures...that enhance Montana's natural and cultural resources.

Economic vitality...for Montana's communities and tourism industry.

Accessibility...within a short distance of where most Montanans live.

Key linkages...between important trail systems, population centers, and other major destinations.

Information...on trail opportunities as well as on improving safety, reducing conflicts, and minimizing environmental impacts.

Transportation links...to the primary transportation network in the state, with alternatives to vehicular transportation where appropriate.

Cooperation...among local governments, state agencies, tribal governments, the federal government, private landowners, and trail users.

The trails planning process is not likely to be easy or painless, but it has the potential to focus the energy behind the varying perspectives, using it to generate creative, cooperative solutions to the problems and opportunities identified at the recent public workshops. If you have questions or comments about the Montana Trails Plan and EIS, please write or phone Jeff Erickson or Bob Walker at: Parks Division, FWP, 1420 East Sixth Ave., P.O. Box 200701, Helena, MT 59620-0701; (406) 444-3750.

GEORGE WUERTHNER

Montanans Help Identify Key Trail Issues

Last fall, 18 scoping workshops were held around the state to ask Montanans which issues should be addressed in the Montana Trails Plan and EIS. The meetings were attended by more than 400 people, and an additional 315 people mailed in written comments. While dozens of issues were identified during the scoping meetings, the following statewide needs were among those mentioned most often:

- More trail-related education (e.g., improved safety, ethics, etiquette).
- More trail funding (especially for nonmotorized uses).
- Better trail maintenance.
- More active enforcement.
- Improved mechanisms for addressing user conflicts.
- More quiet, nonmotorized trails.
- More loop trails and better connections between systems; add greenways and longer trails to the network.
- Improved access across private land to public trails; secure more trail rights-of-way.
- Address trail closures in trails plan.
- Reopen and restore abandoned trails and trail accesses.
- More multiple use.
- Better interagency coordination.
- Develop more urban trails, and integrate with local transportation and land use planning.
- Give more attention to trail-related resource impacts (e.g., wildlife, vegetation, soil).
- Improved trail information (e.g., maps, signing, computer data bases, closure information, etc.)

The scoping meetings identified significant areas of agreement, as well as disagreement, among various trail users. Motorized and nonmotorized users generally concurred on the need for improved trail access, connections, coordination, education, enforcement, maintenance, and funding. But while many motorized users emphasized the value of multiple-use trails, a significant number of "quiet" trail users expressed a desire for more trails open only to nonmotorized use. Using areas of agreement as a starting point, the challenge will be to arrive at balanced trail recommendations that meet the needs of a variety of users, while conserving key resources.

state parks make

MEMORIES

by DEBBIE CHEEK

During the 1994-1995 school year, the Parks Division of Montana Fish, Wildlife & Parks conducted its fourth annual State Parks Poster Contest for fifth grade students. The theme, "State Parks Make Memories," generated the largest number of posters ever received from students across Montana. A panel of five judges had a difficult time selecting the winners from an assortment of creative, well-done posters. Without a doubt, Montana has its share of talented young artists!

The first place award went to JAMIE STANLEY, a student at Whitefish Central School. Her excellent watercolor poster (the first ever received in the contest) shows some of the plants, animals, and scenery that create memories for her while visiting Whitefish Lake State Park.

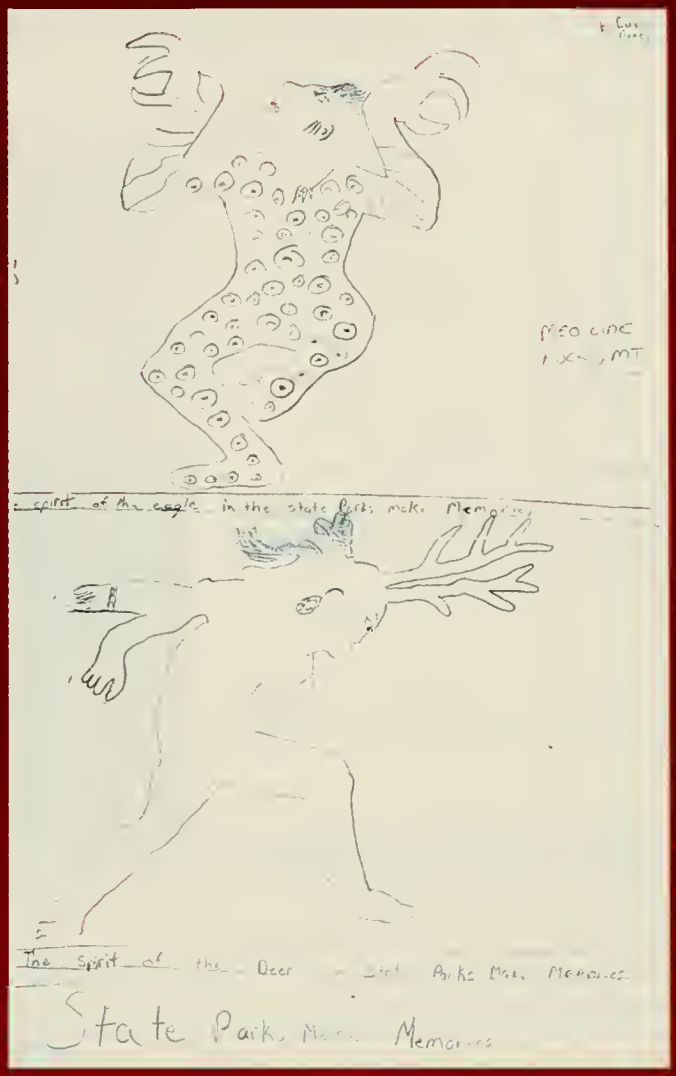
DUANE DONEY from the Hays Lodgepole School took second place with a poster demonstrating how the spirit of the eagle and the spirit of the deer at Medicine Rocks State Park make memories he can share with all people.

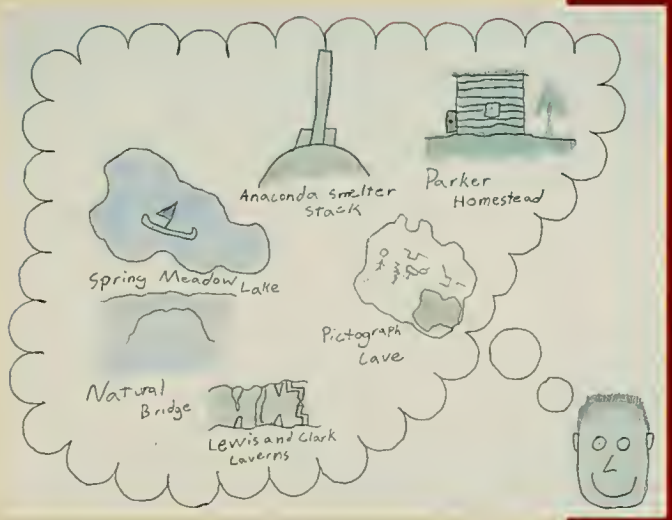
Two young artists tied for third place: KYLE STERNBERG from Smith School in Helena and NATHAN CLOSSON from Whitefish Central School. Kyle's imaginative poster illustrates the memories he has of six Montana State Parks he has visited, while Nathan's scenic poster depicts the serene beauty of the land and the majesty of the animals he sees when he visits Whitefish Lake State Park.

first place—JAMIE STANLEY

The first place winner received a $150 savings bond, the second place winner a $100 bond, and the third place winners $50 bonds. All contest participants received a T-shirt with the winning poster printed on it.

The winning entries have already been displayed in Helena and Kalispell, and will be on display at FWP regional headquarters during the following times: Missoula, 6/26 to 7/14; Bozeman, 7/17 to 8/4; Billings, 8/7 to 8/25; Miles City, 8/28 to 9/15; and Great Falls, 9/18 to 10/6. ■





third place (tie)—KYLE STERNBERG

FWP's "Mr. Wildlife" Retires

After 25 years with Montana Fish, Wildlife & Parks, Vince Yannone retired from his post as assistant administrator for the agency's Conservation Education Division on May 12, 1995.

Vince, one of the most popular personalities in Montana, began developing the agency's youth education programs in 1970. His unique personality and sense of humor quickly made him a favorite presenter throughout the Montana school system.

Before the end of his first year with the agency Vince was promoted to hunter safety project leader, and five months later to education assistant. In 1977 he became an information officer, and in 1983 he was promoted to assistant administrator of the Conservation Education Division.

From the start, it didn't take long for the accolades to start rolling in. Shortly after Vince was hired a parent called Director Frank Dunkle to say his child came home after one of Vince's presentations "more enthusiastic" than ever before. Another early letter in the Yannone archives relates how a quiet school boy turned bright and eager to learn after a talk by "that guy" from FWP. The teacher wrote saying, "Getting this boy to talk in class never before raised such prolific comments."

Perhaps one of the highest tributes continually paid to Vince is that many of the children he has taught come back and ask him to present the commencement address at their high school graduation.

The accolades still come in from impressed parents and teachers, but, because of his extraordinary talent, Vince's audience has expanded. On behalf of FWP, Vince has crisscrossed the state presenting wildlife programs to doctors, lawyers, educators, and landowners. He has probably served as master of ceremonies for every civic club banquet in Montana at one time or another. He has had his own daily television show, and has been a popular guest on Helena's radio and television stations.

Vince Yannone, who retired in May after 25 years as an FWP conservation educator, taught thousands of Montanans about wildlife and had a great deal of fun doing it.

Several years ago, Vince was selected as a "Local Hero" by the *Helena Independent Record*, and the *Great Falls Tribune* dubbed him "Mr. Wildlife."

Vince's gift for communicating with people of all ages and from all walks of life is well known, but that gift sometimes overshadowed his uncommon compassion for wildlife. His tireless efforts to rehabilitate and find homes for the injured or orphaned wild animals that come to FWP's animal shelter have gone virtually unnoticed. Numerous eagles, songbirds, bears, foxes, mountain lions, deer, antelope, elk, and even moose have been returned to the wild or placed in zoos due to Vince's humane efforts. His recent experiment to "teach" orphaned bear cubs to hibernate—so they could be placed in man-made dens in the dead of winter—has proven remarkably successful.

His work to establish Project Wild as an elementary and secondary school curriculum will be recorded as one his most important accomplishments. In 1990, Vince was nationally honored with the Project Wild Director's Award.

The award is an example of another well deserved tribute in a long and accomplished career. His tenure with FWP was so exceptional because he did so much and had an enormous amount of fun doing it.

It's appropriate to mention Vince's trademark ending to every wildlife presentation: "There are four things to remember. To survive, wildlife need clean air, food, water, and a place to live."

Although he will be sorely missed at FWP, we take some comfort in knowing that Vince will continue his conservation education efforts with the Rocky Mountain Elk Foundation in Missoula, Montana. We all wish him luck and good health.—*Tom Palmer, Conservation Education Division, Helena*

Governor Names Tash, Dascher to FWP Commission

Governor Marc Racicot announced the appointment of two new members to the Montana Fish, Wildlife & Parks Commission in April.

Dale Tash

Dale Tash, Ph.D., a retired dean of academics and history professor at Western Montana College in Dillon, was named to represent the interests of southwestern Montanans on the commission. Since his retirement, Tash has remained in Dillon and served for many years as manager of FWP's historic Bannack State Park. An active member of the Dillon community and an avid, lifelong sportman, Tash replaces Elaine Allestad of Big Timber on the five-member commission.

Darlyne Dascher

Darlyne Dascher, from Fort Peck, is a partner in a large ranch operation near Wolf Point. After earning her Bachelor of Science degree in physical education and history from Eastern Montana College in Billings, she worked as a secondary school teacher for five years. She is an emergency medical technician and serves as a local brand inspector. Dascher is a member of the McCone County Planning Board and the Montana Cattlewomen's Association, and is a former president of the Round Circle Cowbells.

Dascher replaces James Rector of Glasgow in representing the resource-related interests of northeastern Montana residents. In being named to the commission, she becomes the second woman, following Allestad, to serve on FWP's policy-setting board.

Video Magazine Available

The Spring 1995 *Montana Outdoors Video Magazine* is currently available from the Video Production Unit in Helena. This video features segments on whirling disease in the upper Madison River, FWP's draft environmental impact statement on mountain lions, a legislative update with Director Pat Graham, and new opportunities in Montana's state parks. For your copy of the Spring 1995 *Montana Outdoors Video Magazine* call or write: Video Production Unit; Montana Fish, Wildlife & Parks; 930 W. Custer Ave.; Helena, MT 59620; (406) 444-2733.

Montana State Parks Calendar

July

4—Fort Owen Day at Fort Owen State Park

Ceremony and celebration to commemorate Montana's first permanent white settlement in 1841. Call 542-5500 for details.

15—Spring Meadow Lake State Park Triathlon

Biking, running, and swimming. Call 444-4720 for details.

15-16—Bannack Days at Bannack State Park

History comes alive in this celebration of the Montana frontier. Activities include pioneer skill demonstrations, old-time music and food, old-fashioned melodramas and skits, wagon rides, gold panning, dancing, and more.

22—Kids' Day at Spring Meadow Lake State Park

This special day of activities for children includes bicycle safety, flyfishing and spincasting, water safety, birdwatching techniques, games, prizes, and food.

22-23—Ninth Annual Jordan/Hell Creek Walleye Tournament

$170 per team, limit of 125 teams. Call 228-9347 or 232-4365 for details.

23—Seniors' Day at Spring Meadow Lake State Park

A special day of fun activities for senior citizens.

29—Beach Games at Lake Elmo State Park

A variety of fun and crazy sports events held on the beach of Lake Elmo. Activities include the keg toss, canoe race, football toss, paddleboat races, games, prizes, and food. Call 252-4654 for details.

August

5—Third Annual Youth Fishing Tournament at Hell Creek State Park

Limited to children 5 to 13 years of age. A $10 entry fee includes lunch and T-shirt. Call 232-4365 for details.

12—Garden City Triathlon at Frenchtown Pond State Park

Swim, bicycle, and run beginning and ending at the park. For further information call 542-5500.

12—Spring Meadow Lake State Park Bat Watch

Beginning at dusk, the Last Chance Audubon Society sponsors an educational program on bat ecology and behavior. Call 444-4720 for details.

18-19—Dinner Theater in the Park at Makoshika State Park

An outdoor dinner followed by a play in the park. Call 365-6256 for details.

19—Second Annual Women's Jackpot Walleye Tournament at Hell Creek State Park

$20 per team, limit of 50 teams. Call 232-4365 for details.

26—Tour of the Night Skies at Frenchtown Pond State Park

Tour the universe with the Western Montana Astronomical Association. Call 542-5500 for details.

SEEKING PEACE ON MONTANA'S RIVERS

DUSAN SMETANA

by Gary (Woody) Baxter
Blackfoot River Recreation Manager
Parks Division

We've all seen articles, photos, videos, or Oscar-winning motion pictures depicting the rivers and streams of Montana and the northern Rocky Mountains as lonely, seldom-visited places. But to anyone who has recreated on a Montana river recently, it's beginning to feel a little like the sidewalks of Hollywood out there.

On the Blackfoot River near Missoula, for example, fishing pressure increased from 15,129 angler-days in 1989 to 34,179 in 1993, a whopping 125% increase. At the traditional launch site on the Smith River southwest of Great Falls, an estimated 1,153 floaters headed downriver in 1983, compared with 3,458 a decade later. On an August day at the take-out site on the 12-mile section of the Bighorn River just below Yellowtail Dam, one can routinely observe 100 to 150 vehicles awaiting their owners' return.

The impression that Montana's

MIKE GURNETT

RON SPOMER

On the popular 12-mile section of the Bighorn River below Yellowtail Dam (left), it's not uncommon to see 100 to 150 cars parked at the take-out on an August afternoon. A River Recreation Conflicts Group was formed in 1994 to investigate possible ways of alleviating river crowding.

rivers are becoming overcrowded is shared by many recreationists throughout the state. Canoeists, rafters, kayakers, motor boaters, anglers, and commercial outfitters are all feeling the strain, and are becoming less satisfied with their experiences on Montana's waterways.

In spring of 1994, Montana Fish, Wildlife & Parks decided it was time to pull together representatives of the various interests and natural resource agencies to discuss river recreation conflicts in the hope of finding solutions. This first meeting of the River Recreation Conflicts Group led to formation of two committees: one charged with addressing river etiquette and ethical practices, and the other with investigating possible legislative measures to alleviate river crowding.

The ethics committee, of which I am a member, has concentrated on informing Montanans about the role of ethics and etiquette in river recreation. The committee believes that in many cases persons acting irresponsibly may not be aware of the dissatisfaction they are causing others. Dianne McDermand, a committee member representing the Medicine River Canoe Club of Great Falls, feels the committee's ethical guidelines should be viewed as suggestions, rather than rules or regulations. "We want to educate rather than regulate," she says.

For example, one situation commonly encountered on many rivers involves conflicts between boaters and wading anglers. By looking out for waders and other craft just as they would natural obstacles such as logs and rocks, boaters can often plan a route that keeps them a safe distance away from anglers or the waters they are fishing. If a boat must closely approach an angler to avoid disturbing the area being fished, then the boat occupants should explain their actions. If an angler's fishing hole can't be avoided, the boaters should apologize, letting the angler know they meant well but couldn't avoid the disturbance. Of course, there are instances when wading anglers should yield to floaters because there is no other channel for floaters to navigate.

The committee also suggests using a "visual rule of crowding" to minimize conflicts with other recreationists—anglers, for example, should attempt to keep out of sight of one another if possible, especially on smaller streams. Of course, this guideline would be difficult to exercise during an insect hatch on some of Montana's more popular rivers. Even under crowded conditions, however, it's common courtesy to give fellow anglers plenty of room.

Another point of etiquette sometimes overlooked by boaters is the importance of launching quickly when using a boat ramp or launch site so that others don't have to wait in line. When rafting, this means having the boat inflated, the rowing frame ready, and most of the gear in the raft before moving to the river's edge. Canoeists and kayakers should put their lighter items into the boats before approaching the launch area. Fishing rods should be rigged and unrigged well away from the access ramp. Once in the water, boats should clear the launch area as soon as possible.

Operators of motorized boats and personal watercraft such as jet skis should remember the wakes they create

can be hazardous and intimidating to canoeists or kayakers and wading anglers. Lew Tripp of Missoula, who represents a group of jet boat users, suggests that motorized craft travel at no-wake speed whenever possible if floaters or wading anglers are in the area. Other river recreationists, in turn, should understand that motorized craft may have to speed up under certain conditions—for example, when navigating up or down rapids.

Other guidelines for river users identified by the ethics committee include:

• Floaters should respect ranchers' needs for fencing and learn how to use float gates and portage routes. Several rivers feature float gates constructed cooperatively by FWP and private landowners to prevent livestock from moving from one side of the fence to the other, while still allowing boat passage.

• When possible, wading anglers should avoid using the streambed as a pathway, because foot traffic can damage fragile aquatic habitats. Anglers should use the shoreline to travel from one point to another if doing so doesn't violate trespass laws.

• River recreationists need to respect private property and understand Montana's trespass and stream access laws. It is the responsibility of floaters and anglers to know when they are entering or passing through private land. Remember that recreational use is permitted on navigable streams only between the high water marks, and that grassy streamside benches and higher banks on private land are often above this level.

• Floating anglers should avoid dragging their anchor along the stream bottom to slow the boat's progress, a practice that adversely affects aquatic life. Outfitter and Trout Unlimited member Al Wind suggests anglers use only their oars to check the boat's speed, and anchor in slow current where a boat can successfully be held in place.

• Recreationists should leave nothing along a waterway; as the old adage says, "If you pack it in, pack it out." Although river managers are finding less litter along our streams than in the 1960s and 70s, it remains a problem. Much of the material now being encountered is fishing tackle waste like leader wrappers, tippet material, strike indicators, and styrofoam bait containers.

• Use of firearms in a river corridor should be limited to hunting seasons. Target shooting can be hazardous and intimidating to other river users.

• To help preserve the quality of Montana's water-based recreation, all users need to police their own ranks and help educate others; when boating or fishing violations are observed, authorities should be contacted.

Because recreational use of many of Montana's waterways is likely to increase in years to come, the potential for conflicts will continue. Yet, it is the committee's belief that river conflicts are not caused solely by overcrowding, but rather by the inappropriate attitudes and practices of a few recreationists. Education, cooperation, and communication can go a long way toward ensuring a quality recreational experience for everyone using Montana's rivers.

Although river managers are finding less litter along our streams than in the 1960s and 1970s, it remains a problem. Much of the material now being encountered is fishing tackle waste like tippet material, strike indicators, and styrofoam bait containers.

RODNEY SCHLECHT

WINGSHOOTER'S GUIDE TO MONTANA, by Chuck Johnson and Ben O. Williams, Wilderness Adventures Press, P.O. Box 1410, Bozeman, MT 59771; 1995, 288 pages, soft cover, $27.00 plus $3.00 shipping.

This comprehensive hunting guide contains a wealth of information on upland game bird and waterfowl distribution, identification, and behavior; on hunting conditions and regulations; and on accommodations and services available to hunters as they travel the state. The authors, both seasoned wingshooters and bird dog owners, have traveled widely in pursuit of game birds and understand the questions, problems, and challenges encountered by hunters exploring new territory. That's why they've taken pains to include details on things like motels (including whether they allow dogs in rooms), veterinarians, auto repair facilities, sporting goods stores, and restaurants.

But the heart of the book addresses the birds themselves: where to find them (including distribution maps), how to identify them, the types of habitat they prefer, their feeding habits and patterns, and hunting methods. Each game bird profile includes sections on hunting with dogs, table preparations, and shot and choke suggestions. The book also includes a few hunting yarns that capture the flavor of typical Montana bird hunts, as well as nearly 50 of Ben O. Williams' classic bird hunting photos.

As noted outdoor writer Charley Waterman says in the book's foreword, "...when a hunter has read most of it, there will be very, very few people who will know as much about Montana shotgunning as he or she does."

MONTANA IS... by Mike Logan, Buglin' Bull Press, 32 S. Howie, Helena, MT 59601; 1995, 34-minute video, $14.95 plus $4.00 shipping and handling.

Several years back, Mike Logan blended his artistic talents as a photographer and poet in the publication of a book called *Montana Is....* An instant success, the book quickly went through several printings (it's still available from Buglin' Bull Press at the above address).

But for anyone who has heard Mike read his poetry, the book's only "shortcoming" was the inability to hear Mike's rich voice emanating from the pages—a shortcoming that has been resolved with release of *Montana Is...* in video form.

Like the book, the video is a photographic roundup of Mike's impressions of Montana—its ranch life, scenic beauty, and spectacular wildlife—but with the added feature of Mike reciting the original poem that made the book so popular. As a bonus, Mike reads also from his classic trilogy of cowboy poetry, *Bronc to Breakfast, Laugh Kills Lonesome, and Men of the Open Range*. Often inspired by paintings of the great cowboy artist Charles Russell, Mike's poems support and deepen his vision of what Montana is all about.

WILD SHEEP COUNTRY, text by Valerius Geist and photography by Michael H. Francis, NorthWord Press, Box 1360, Minocqua, WI 54548; 1993, 176 pages, hard cover, $39.00.

A perfect marriage of text and photography, this large-format book will appeal to wildlife enthusiasts, scientists, photographers, hunters, and nature lovers—in short, anyone who admires North America's wild sheep.

Author-biologist Valerius Geist, a professor of environmental sciences at the University of Calgary, is one of the world's foremost authorities on mountain sheep and the first scientist to study Stone's sheep, the beautiful dark-coated animal indigenous to northern British Columbia and the southern Yukon Territory of Canada. In the book's first chapter he takes us high above the clouds to study the lives of the various types of mountain sheep and the rugged, inhospitable terrain they depend on for survival.

Subsequent chapters delve into sheep taxonomy, a comparison of mountain sheep and mountain goats, the importance of horns in determining social hierarchy, sheep communication, rutting behavior, and evolution.

In gathering the more than 150 color photographs used in the book, Billings-based wildlife photographer Michael H. Francis traveled thousands of miles from the Mexican border almost to the Arctic Circle. As a result, readers are treated to a stunning array of photos that showcase these remarkable animals and the beautiful country they inhabit .

THE CORDES/LAFONTAINE POCKET GUIDE TO DRY FLY FISHING, by Ron Cordes and Gary LaFontaine, Greycliff Publishing Co., P.O. Box 1273, Helena, MT 59624; 1994, 26 pages, spiral bound, $12.95 plus $2.00 postage.

Compact and durable, this handy book is a tightly focused, concise reference to everything you need to know when confronted with the special problems of dry fly fishing: how to read rise forms, the influence of water temperature on feeding, prime feeding locations, the major hatches throughout the country, discussion of pattern types and when to fish them, key fishing strategies, and the best locations to fish. It will fit easily in your shirt pocket or fishing vest, and the pages, which are spiral bound for easy opening, are made of hard, waterproof plastic. It's one guidebook you can actually take fishing with you without fear of ruining it.

Cordes and LaFontaine, both well known for their research and writing in the field of fly fishing, have also collaborated to produce guides to nymph fishing and fly fishing in lakes. Other books in the Cordes/LaFontaine pocket guide series, written with the help of experts in various fields, include canoeing, outdoor survival, photography, cross country skiing, hiking and backpacking, target archery, animal tracks, and emergency first aid. All the books are available from Greycliff Publishing Co.

MORE COMMENTS ON WILDLIFE PHOTOS

Letters Policy: We welcome letters on any subject appearing in the pages of Montana Outdoors*—while we may not be able to publish all letters due to space considerations, we try to publish a representative sample. We reserve the right to edit letters for length and clarity.—Ed.*

I applaud your answer to the individual who complained regarding possible zoo, game farm, etc. photos being used for publication (March/April 1995 "Readers Respond"). Most complaints of this type are from want-to-be nature photographers who must degrade others' photos because theirs do not come up to the competitive standards of the photos used to illustrate our magazines of today. Many of the top nature photographers have taken photos of captive animals, leading tours while accomplishing this. Therefore, the critics can be as pure about their photography as they want but they are not going to convert everyone to their philosophy. The answer seems to not lie in throwing stones at others simply because they adhere to a different value system. The fact that a photographer has hung by his toes from a 2,000-foot cliff or hiked 40 miles to capture his photograph doesn't necessarily make it an outstanding photo. The bottom line is image quality. The general public wants quality photos, not a true confession about each image it views. Let the photo stand on its own merit. The editor is paid to make the choice of which is worthy.

I find it difficult to believe that these same individuals who complain are taking pictures of tame animals in national parks, photographing birds at feeders or in local city parks where they are well fed and tame, and baiting in animals, then remarking that they only photograph "wild" animals.

Digital manipulation is another concern. I recently saw a picture of a hummingbird at a flower in *Outdoor Photography* magazine. I read the caption only to discover the hummingbird was taken on Velvia film and the flower on Kodachrome 64. Hello, computer! I recall when photographers bad-mouthed auto-focus cameras, but now most of them are using them.

There are many changes occurring in photography; we can either accept or reject them but sitting in an ivory tower judging others isn't going to prevent these changes from happening. My advice to them is, "Stop complaining and let me see those stunning images I'm sure you are capable of producing."—*Alan Nelson, Great Falls*

I read with interest the letter from Phyllis Wolfe (March/April 1995 "Readers Respond"), particularly since I am a professional wildlife photographer.

Her concerns are not new, either from the public or professional perspectives. What does seem to be changing are responses to the question of "acceptable." This question becomes even more complicated when considering the newest practice of digital manipulation of wildlife images.

Personally, I use neither captive nor "rental" animals. I also do not as yet buy into the use of digital imaging for editorial purposes. I must admit however, that I am leaning more toward a belief in freedom from constraints for "artistic expression." The noted photographer Art Wolfe makes a valid argument for his own photo manipulations.

Regarding Ms. Wolfe's specific concerns, I must agree with the call for disclosure. A magazine such as yours is *about wildlife*. Were I to simply wish to look at pretty pictures I can go to many sources. As well, captive animals can be found in zoos and circuses. I look to you because you represent the wild left in Montana.

I would never propose that captive animal photos be black-balled. A great photo still takes professional knowledge and talent to obtain. However, considering the editorial goals of your publication, I feel that failure to disclose captive or trained animal photos belittles the work of "natural" photographers such as myself and betrays the trust and confidence of your readers.

Professionally speaking, photographers should have no objections to disclosing their methods of photographing animals. If they are ashamed of their methods, maybe they shouldn't be using them.

Thanks for the opportunity to express my own feelings in short form.—*Daniel D. Lamoreux, Jackson, Wyoming*

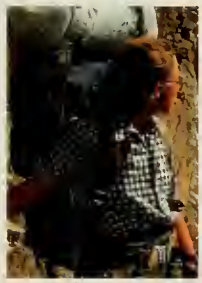
I'm responding because of Phyllis L. Wolfe's letter regarding wildlife photography in the March/April issue. As a reader, I'd be far more interested in seeing the hard-to-photograph "real" shots. I appreciate the work that goes behind obtaining such a photograph.

Knowing that I could get the same shot at some kind of game farm or reserve sort of takes the awe away from the picture. It's sort of like going to a museum to look at a real DaVinci or a counterfeit.—*Wendy Steffenhagen, Wellsville, Utah*

This is in answer to the letter in the March/April issue pertaining to wildlife photos. In my opinion, since this is a state publication edited by FWP, you should insist on knowing where each wildlife photo submitted for publication was taken. I would also suggest that consideration be given to publishing wildlife photos from amateur photographers only. I don't feel this would decrease the quality of your publication, it might even be enhanced. Perhaps you would not even have to pay for accepted photos—most amateurs would be overjoyed to have a photo published in your magazine.—*Jack K. Fletcher, Whitefish*

Contributors

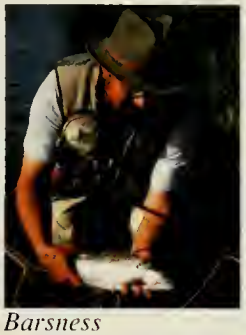
Widely scattered across Montana, special wetlands called "peatlands" have meticulously chronicled landscape changes since the age of the last glaciers. "They are, in a sense, nature's time capsule," says **Bonnie Heidel** in her article beginning on page 2. Although peatlands are mere flecks on Montana's landscape, many of their inhabitants are "biological heirlooms"—species whose fate depends upon the stable habitats that peatlands provide. Heidel is a botanist with the Montana Natural Heritage Program in Helena.


Heidel

Have you ever wondered how many species of butterflies live in Montana? According to **Deborah Richie**, author of this issue's "Watchable Wildlife" segment, there are 186. "To become a butterfly watcher, you must seek sunshine, flowers, and relaxation: a fine prescription for the often harried American lifestyle." To learn more about butterflies and how you can attract them to your yard or garden, turn to "Rainbows on the Wing" (p. 7). Richie is the watchable wildlife coordinator for the U.S. Forest Service in Missoula (a cooperative position with The Nature Conservancy).

Richie

"They usually begin in limestone canyons, up in the mountains that touch the plains....They are the trout streams we have forgotten, because they don't flow near enough to airports, aren't big enough for drift boats, and their insects mostly fall from above." Thus writes **John Barsness** of Montana's "Forgotten Streams" (p. 13), underfished places where you're likely to hook trout "as confident as retired bankers," and where you won't have an audience while you reel them in. Barsness is a Townsend-based outdoor writer who claims to have caught "close-to-twenty-inch" trout out where the water is about to turn catfish and the sagebrush is winning over the willows.


Barsness

In this issue's "Lands Legacy" installment, **Bruce Auchly** and **Quentin Kujala** describe Ear Mountain WMA, an important area for deer, bighorn sheep, and bears on the east side of the Rocky Mountains near Choteau. In "Spirit of the Front" (p. 18), they point out that "To understand Ear Mountain is to understand the Rocky Mountain Front. All of the Front's wonders and worries, programs and problems, are there in microcosm." Auchly is FWP's information officer for Region 4 (Great Falls), and Kujala, who lives in Fairfield, is the wildlife biologist responsible for Ear Mountain WMA.

Whirling disease—a baffling infection once thought to affect trout and salmon primarily under hatchery conditions—is now threatening the Madison River's wild rainbow trout, says **Tom Palmer**. In "Trouble in Trout Paradise" (p. 21), he delves into the complex life cycle of *Myxobolus cerebralis*, a microscopic parasite recently discovered in the Madison River and several other Montana locations. Palmer is an information officer stationed at FWP headquarters in Helena.

Whether it's backpacking through a wilderness area, snowmobiling in a national forest, or biking an urban riverfront trail, Montanans enjoy a wide range of trail-based activities. While we all agree that our trails are something to protect and be proud of, we don't always agree on how they should be managed, however. "In the midst of these varying viewpoints," says **Jeff Erickson**, "Montana recently launched a process to develop a comprehensive, statewide trails plan." To learn more about this effort and how it has the potential to improve our recreational network, turn to "A New Plan for Montana's Trails" on page 25. Erickson is an outdoor recreation planner in FWP's Parks Division in Helena.

Erickson

This year's State Parks Poster Contest for fifth grade students—based on the theme "State Parks Make Memories"—attracted a record number of colorful, imaginative posters. Beginning on page 28, **Debbie Cheek**, field support supervisor for the Parks Division in Helena, introduces the winning entries. "A panel of five judges had a difficult time selecting the winners from an assortment of creative, well-done posters," says Cheek. The posters will be on display at FWP regional headquarters through summer and early fall.

MO thanks the following artists and photographers for their contributions to this issue: **Stuart Armstrong**, Silver Spring, MD; **John Barsness**, Townsend; **Steve Chadde**, Calumet, MI; **Al DeMangelaere**, Pompey's Pillar; **Kristi DuBois**, Bountiful, UT; **Diane Ensign**, and **Dusan Smetana**, Bozeman; **Wallace Haley**, Waterford, NY; **Mike Logan**, **Mitchell Paulson**, and **Jim Reichel**, Helena; **Maria Mantas**, Kalispell; **Dave McGee**, and **Rodney Schlecht**, Great Falls; **Bill McRae**, Fairfield; **Ron Spomer**, Troy, ID; **Dee Strickler**, Columbia Falls; **Steve Wirt**, Whitefish; and **George Wuerthner**, Eugene, OR. Thanks also to the following contributors who work for the department: **Mike Gurnett**, Helena and **Quentin Kujala**, Fairfield.